DOCUMENT RESUME

ED 045 836 VT 012 296

| | |
|---|---|
| AUTHOR | Cohen, Malcolm S.; And Others |
| TITLE | A Micro Model of Labor Supply. BLS Staff Paper 4. |
| INSTITUTION | Bureau of Labor Statistics (DOL), Washington, D.C. |
| PUB DATE | 70 |
| NOTE | 249p. |
| AVAILABLE FROM | Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (L2.71/5:4,$1.00) |
| EDRS PRICE | EDRS Price MF-$1.00 HC Not Available from EDRS. |
| DESCRIPTORS | *Economic Research, Employment Level, *Labor Economics, *Labor Force, Labor Force Nonparticipants, *Labor Supply, *Mathematical Models, Working Women, Youth Employment |

ABSTRACT

This cross section micro model of labor supply uses area variables to identify the response of individuals to area labor market conditions, while simultaneously estimating individual and family effects on labor supply. Interactions between variables are specified in the model, as are the relative effects of offsetting variables, such as the income and substitution effects. Using a continuous measure of labor supply, the study analyzes separately the labor force behavior of men, women, and youth during the 1966-67 period of high employment. Because of large discouragement effects which were found among marginal workers, the study concludes that present manpower programs underestimate the problem of hidden unemployment. In addition, the discovery that hourly earnings and hours supplied are inversely related provides support for new policies of income redistribution. Applications of the model in projecting future labor force participation are discussed. (RH)

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U.S. DEPARTMENT
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U.S. DEPARTMENT
OF LABOR
George P. Shultz, Secretary

Bureau of
Labor Statistics
Geoffrey H. Moore, Commissioner

1970

# A Micro Model of Labor Supply

by

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and
Robert I. Lerman



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Washington, D.C. 20402 - Price $1

## Preface

The Staff Paper series offers a means of publishing original work, by BLS professional employees, which will make a significant contribution to the Bureau's field of interest.

The papers do not necessarily deal with BLS data but may report on a range of subjects, including experimental work on statistical theory as well as analysis and interpretation of economic or social data.

The papers are intended to be provocative, and represent the personal opinions of the individual authors.

The model of labor supply developed in this study is, in effect, three separate models, one each for adult men, adult women, and youths. It differs from previous models in that it combines individual and family characteristics in the same equation as area labor market variables. Micro data from the March 1967, Current Population Survey (CPS) were used to build the model. Thus, other micro studies which used data from the 1960 Census of Population have been updated by seven years. All persons, 16 and over in the civilian noninstitutional population, were included in the study.

Malcolm S. Cohen, assistant professor of economics at the University of Michigan, coordinated the study and did the empirical work on adult women. Robert I. Lerman, an instructor at the Graduate School of Business, University of Pittsburgh, did the empirical work on youths, and Samuel A. Rea, Jr., a graduate student at Harvard University did the empirical work on adult men. The study was initiated while the authors were employees of the Division of Economic Studies, Office of the Chief Economist, Bureau of Labor Statistics. The authors owe a debt of gratitude to Hyman L. Lewis, formerly of the Division of Economic Studies, for the valuable suggestions, support, and encouragement he gave throughout the study.

**Contents**

## Chapter I. Introduction

The factors affecting the supply of labor have received a great deal of attention in the last few years. Both macro and micro models have been used to explain and predict cyclical and secular variations in the supply of labor.

The purpose of this paper is to present a cross section micro model of labor supply and discuss the policy implications that can be derived from the model.

The model described and tested here has several features.

First, it links the characteristics of different family members. A theory of family utility presented in chapter IV underlies the development of this link.

Second, included in the model are area variables which identify the response of individuals to the labor market conditions of the Standard Metropolitan Statistical Area (SMSA) in which the individual resides.

Third, the model does not assume additivity but specifies interactions between variables.

Fourth, alternative measures of the supply of labor are used in the model. These measures include: (1) Whether the individual was in or out of the labor force during March 1967; (2) an estimate of the man-hours an individual supplied during 1966; and (3) whether an individual was in the labor force at any time during 1966.

Fifth, short- and long-run income and substitution variables are used in the model testing which variables are the strongest determinants of the decision to supply labor.

### Previous Empirical Work

Jacob Mincer (1966) provides an excellent survey of labor force participation literature. In his review of the literature, he distinguished three types of studies of the labor force: Those using monthly gross flow data, cross section data, and time series data.

Most of the previous studies used data from either the Current Population Survey (CPS) which is described in appendix E or the decennial Census of Population. 1/

The gross change studies examine the month-to-month change in the labor force status of individuals. In this type of study, individual movements between employment, unemployment and out of the labor force can be identified. Gross flow studies (Hansen, Altman) have not been too instructive due to serious biases in the data (Pearl, Hilaski).

Cross section analyses of labor force participation have been done by Bowen and Finegan (1965 and 1966), Glen Cain, Richard Rosett, Guy Orcutt, et. al., James Morgan, et. al., Thomas Mahoney, Steiner and Dorfman, Jacob Mincer (1962), and J. D. Mooney. A detailed discussion of some of the cross sectional variables will be presented in later chapters.

The third type of data used in labor force analyses is time series data. Dernburg and Strand, Tella (1964 and 1965), and Cooper and Johnston have estimated time series participation equations.

Cross Section Variables

The present study is a cross section study. Unlike many other cross section studies, the observations are not labor markets or Census tracts, but individuals. However, the study uses a number of area characteristics which are assigned to individuals living in each area. Two examples of area variables are the unemployment rate, and the employment change in the SMSA.

Difference in the interpretation of cross section studies using areas as observations and the studies using individuals as observations should be emphasized. The former has been called ecological

1/ Some notable exceptions were: A study by James Morgan, Martin David, Wilbur Cohen and Harvey Brazer, Income and Welfare in the United States, (New York, McGraw Hill, 1962). This study which included chapters on labor force participation was based on data collected by The University of Michigan Survey Research Center. See also, Richard Rosett, pp. 51-101; Thomas Mahoney, pp. 563-577; and Glen Cain.

correlation in the sociological literature. In the econometrics literature it is discussed under the topic of linear aggregation problems. In 1950, W. S. Robinson pointed out that individual relationships inferred from area data may be seriously biased and he cautioned against their use. Later Duncan pointed out that ecological correlations might be useful. Theil's more general work on linear aggregation came later.

The ecological correlation problem arises when the relationships computed between areas are interpreted as relationships between individuals. As Duncan has shown, some strong assumptions have to be made to infer individual characteristics from area observations. 2/ If relationships computed among areas are interpreted as area relationships, no ecological problem is involved.

In developing a model of labor supply, inclusion of both area relationships and individual relationships would be desirable. The difficulty in using areas as observations to explain both individual and area relationships is apparent in the case of the discouraged worker and additional worker hypothesis, the labor force participation of wives is negatively related to the unemployment rate in the women's local labor market, ceteris paribus. Women become discouraged from looking for work as area unemployment increases. The additional worker hypothesis is that, ceteris paribus, married women enter the labor force in response to the income loss that results from the unemployment of their husbands. If areas are the observations, it is difficult to separate the two relationships. A high area unemployment rate both discourages wives from participating because of the lack of jobs and induces labor force participation on the part of married women because of the increased unemployment of husbands. Area income of married men to some extent reflects the loss of income to families with unemployed husbands. However, area income also measures long run income differences rather than the transitory income

2/ See Duncan, Statistical Geography, pp. 64-80.

changes that result from the husband's unemployment.

In this study, we improve considerably the specification of individual and area relationships by using individuals as observations and associated individual, family, and area characteristics as variables. In order to separate additional and discouraged worker effects, we include the husband's income or employment status and the area unemployment rate in the same regression. Holding constant the husband's income or employment status, we interpret the impact of the area unemployment rate on the labor force participation of wives as the discouraged worker effect. The wife's labor force response to the husband's income or employment status is tested in a regression that controls for differences in area unemployment rates.

Although this is a cross section study, some temporal inferences may be drawn. Both short- and long-run employment opportunity variables are constructed for each SMSA. This provides a measure of the different response of individuals to changes in employment opportunities. The differential response of women, men, married women, single women, etc., to changes in labor force participation can also be measured. Our theoretical model is developed in more detail in the following chapters.

Supply Curve Identification

Economists usually discuss labor supply decisions in terms of one individual or more with identical tastes. With a single set of preferences one can analyze the individual's response to wage and income changes, and then aggregate for an economy-wide supply function. This theory will be discussed in greater detail in chapter III, but first we must consider the relationship between the theoretical and the empirically estimated supply curves.

Martin S. Feldstein points out that the cross section studies, Douglas and Finegan, for example, done between areas fail to identify a supply curve for weekly hours, since differences in supply curves

between areas have not been accounted for. This may be true, but Feldstein's solution introduces another problem. He takes small labor market segments defined by area, occupation, and industry and assumes that each firm in the market faces the same supply curve. 3/ In each labor market every firm with identical working conditions must pay the same wage, otherwise employees will move from low wage to high wage employers. The fact that wages do differ is evidence that the extent of the market has not been properly defined. He justifies this by assuming that each firm offers a fixed set of hours as well as a wage rate. However, it is usual to assume that the firm is indifferent as to the number of hours worked per man within an appropriate range. His procedure would identify a supply curve even if every individual has an identical supply curve and every firm has an identical demand curve. The necessary assumptions are that output is a function of the number of man-hours worked and is independent of the number of hours per laborer, that each firm faces its own labor market, that each market is different in size, and that the firms do not take advantage of their monopsony powers. The cross section relationship between the average hours worked and the wage rate will identify a supply curve. The relationship between total man-hours per firm and the wage rate will identify a demand curve. If demand curves differ, this will make it easier to identify the supply curve. The assumption that each firm faces its own market is questionable, so the differences in wages between firms in Feldstein's samples will be dominated by labor market frictions unless it is true that firms can only vary the number of hours per man at considerable cost. His ambiguous empirical results do not offer support to this theory.

The differences in wages between cities can be explained more easily by a lack of perfect mobility than can differences between firms.

3/ See the approach to the relative supply of unskilled labor discussed by Malcolm S. Cohen, "The Determinants of the Relative Supply and Demand for Unskilled Labor" (Unpublished Ph. D. dissertation, M.I.T., 1967), Chs. I-II and pp. 187-192.

Again, differences in the size of the labor pool help to identify the supply curve. In addition, differences in the number of firms, even if they are identical, will give wage differences between cities. There will also be a great deal of variation in the firm demand curves themselves. If mobility of firms and workers reduces the spread in wage rates, errors will tend to dominate the estimation.

The most serious problem with aggregate estimation is variation in individual supply curves. Violation of the assumption of constant tastes between markets leads to the identification problem discussed by Feldstein, and this cannot be completely controlled for with ecological variables. Variations in tastes within markets mean that we cannot make predictions about individual behavior with an estimate based on aggregated data.

An additional problem is the lack of equilibrium in the labor market, as revealed by unemployment. The number of hours worked will therefore not equal the number of hours supplied when demand is slack.

Micro economic data has been used in the model in order to identify the variables that determine individual tastes and to avoid the identification problem. These variables are extremely interesting in their own right and tend to dominate the supply function for many groups. In addition, the attitudinal data which are available at the micro level, such as whether the individual is looking for more work, enable us to take account of the excess supply of each individual's labor.

Limitations of the Model

One limitation of the model is that demographic variables, such as whether a woman marries, how many children she has and how they are spaced, how long the children are enrolled in school, may be concurrently determined with the decision to participate or not to participate in the labor force. In the study these variables are treated as exogenous.

A second limitation of the model is that it was based on data pertaining to 1 year only. Pooled cross section and time series data may be possible in a future study.

A third limitation is that even the use of micro data does not allow the economist the control over his experiments that the scientist has over his experiments. Micro economic theory predicts the effects of variables on an individual, given his preferences and the state of the world. In the model, we estimate the supply response to explanatory variables across individuals, rather than analyzing the effect of different levels of a variable on a single individual. Differences in tastes are eliminated by using dummy variables. But this procedure may be imperfect, thus care must be taken not to interpret the results as literal tests of micro-economic theory.

A fourth limitation is that all variables are not measures of unique phenomena. For example, it is difficult to indicate to what degree educational attainment reflects ability, how much it reflects motivation, and how much it reflects training.

A fifth limitation is that data were not always adequate or available for the theoretical model. The wage rate, the number of hours worked, and the number of hours supplied during the year had to be imputed. We would have liked quarterly income data over a number of years to evaluate short- and long-run income responses.

A final limitation has to do with the inclusion of interactions. Further study will improve the specification of interactions in our model. Improper specification of interactions means the predictions are biased if applied to a subgroup not properly specified. Further work should be done specifying Negro adult interactions with area variables.

Organization of Study

The study has been carried out for three subgroups of the population: Adult men (22 and over), adult women (22 and over), and youths (16-21).

Separate models were derived for each of these subgroups and form the core of chapters III through V. Chapter II contains a description of the basic model. The summary and policy implications are discussed in chapter VI.

## Chapter II. The Basic Model—A Summary

The labor supply model predicts the labor supply of youth, adult men and adult women. Independent variables are developed separately for each of these groups. Even within the groups, further subdivisions are made. The youth, 16 to 21 years of age, whose major activity was school were analyzed separately from other youths. Married adult women (22 years old and over) living with their husbands are discussed separately. Other analyses are carried out for all adult women in the sample.

Most of the independent variables are common to all of the equations. The common variables are described in detail in this chapter. Generally, variables specific to one group or more are described in detail in the chapter in which they are relevant.

Each individual in the Current Population Survey is treated as an observation. A description of the CPS and a further discussion of the data is presented in appendix E. The three dependent variables are: (1) Whether or not the individual was in the labor force during March 1967; (2) whether the individual was in the labor force at any time during 1966; and (3) an index of how many hours the individual supplied labor during 1966.

The independent variables discussed in this section are grouped into the following categories: Individual income and substitution, area, family, demographic, ability, and motivation variables.

With this classification scheme, there are some variables that have overlapping effects. For example, race may be a demographic and a motivational variable. Nevertheless, variables are divided into categories for expositional purposes. Because of the authors' orientation as economists, the economic variables are analyzed in the greatest depth.

### Dichotomous Dependent Variables

All three dependent variables are measures of the supply of labor. The first measures whether or not an individual was in the civilian

labor force during the week prior to the survey week during March 1967. The civilian labor force is defined as the total of all employed and unemployed persons. Employment and unemployment are defined in appendix B.

The number of persons in the civilian labor force, expressed as a percent of the total noninstitutional civilian population, age 16 and over, is known as the civilian labor force participation rate. This rate is published monthly in Employment and Earnings.

The first and second dependent variable are dummy variables. These variables can take on the value of one or zero. We arbitrarily assigned the variable a value of one if the individual was in the labor force and a value of zero if the individual was not in the labor force.

The second dependent variable is based on data collected during February 1967, in the work experience supplement to the Current Population Survey. Tabulations from these data were published by the Bureau of Labor Statistics in a Special Labor Force Report. 4/ In our study a person is considered to be in the labor force during 1966 if he worked at least . week during 1966 or if his primary reason for not working was that he was unable to find work.

A person is much more likely to participate in the labor force at some time during the whole year than at some time during a week. During March 1967, the civilian labor force participation rate was 59.5 percent. But persons who were in the labor force at some time during 1966 constituted 67.3 percent of the population 16 and over. This includes 86.3 million individuals 16 and over who worked at least 1 week during 1966 and .5 million who worked no weeks but were counted as part of the labor force because they gave as their main reason for not working, inability to find work.

The difference in the percentage of persons who supplied labor at any time during 1966 and the annual average for 1966 was greater for women than for men. At some time during the year, 50.9 percent of

4/ See Bogan and O'Boyle (1968).

women 16 years and over were in the labor force compared with their annual average labor force participation rate of 40.3 percent. Among men, 85.7 percent were in the labor force at some time during 1966 while their annual average labor force participation rate was 80.4 percent.

As with women, a much larger percent of youth age 16 to 21 years supplied labor at some time during 1966 than the annual average participation rate. Over 71 percent of them supplied labor at some time during 1966 but their annual average participation rate was about 53 percent. During March 1967, the rate was 51.5 percent.

Our definition of 1966 labor force participation excludes from the labor force the 42.3 million persons who worked no weeks in 1966 and gave as their primary reason for being out of the labor force: Illness, or disability, housework, going to school, retirement or service in the armed forces. Of these persons, 0.8 million, mostly women and teenagers, reported that they looked for work at some time during the year.

Continuous Dependent Variables

The third dependent variable is a continuous index of the labor supplied by those who worked at least 1 week during the year. Since labor supply is a flow, it can be expressed in alternative units, such as hours per day, hours per week, days per week, weeks per year or years per lifetime. In addition, a distinction can be made between the time of day, the day of the week, or the season of the year that labor is supplied. The individual who is planning his labor supply will make substitutions between the amount and time pattern of work and leisure. We cannot take account of all of the possible substitutions, but have chosen an index of hours supplied per year as a continuous indicator of labor supply. It is superior to an hour per week measure since it takes account of variation in weeks per year and allows for differences in the pattern of hours within the year due to individual tastes and industry requirements.

Institutionally rigid weekly hours probably have less effect on the hours per year measure than on the hours per week measure. If the standard workweek is not satisfactory, the individual can adjust the number of weeks worked per year or change jobs. Of course, many people may be in jobs which require a standard number of hours per year, and the alternative jobs may not be as attractive in other respects. If this occurs, those working too many hours have a marginal value of time which is greater than their wage, and those working too few hours have a marginal value of time which is less than their wage. 5/ However, the wide scatter in the distribution of the hours per year index which we have derived suggests that this might not be a major problem. (See table 1.)

In dealing with labor supply it is desirable to measure the hours that an individual wanted to work rather than the hours he actually worked. Using hours worked per week as the supply variable as has been done in the past (Kosters, Finegan) not only ignores substitution between hours and weeks, but it mixes together demand and supply effects. Estimating the supply of hours per year requires estimates of the number of weeks desired, assumed to equal the weeks spent looking for a job plus the number of weeks working, and estimates of the desired number of hours per week. A week of looking is assumed to represent the same number of hours supplied as the person's desired workweek. This procedure gives a reasonable approximation for the excess supply of labor. A more refined treatment of unemployment would have to consider the complicated process by which a person weights the probability of finding a job, the present value of future earnings, the costs of the job search, and the value of current leisure.

5/ This latter situation could occur if the costs of coming and going to work or finding a second job and a minimum number of hours in the second job make the second job undesirable. It could also occur if job search costs make a second job undesirable.

Table 1. Estimated man-hours supplied in 1966

| Number of hours in 1966 | Percent of men and women supplying hours | |
|---|---|---|
| | Men age 22 to 54 | Women age 22 to 54 |
| Total..... | 100 | 100 |
| 0 to 299..... | 1.38 | 12.94 |
| 300 to 599..... | .68 | 5.17 |
| 600 to 899..... | 1.64 | 10.20 |
| 900 to 1,199..... | 1.12 | 6.20 |
| 1,200 to 1,499..... | 1.83 | 6.83 |
| 1,500 to 1,799..... | 4.47 | 10.10 |
| 1,800 to 2,099..... | 48.31 | 38.88 |
| 2,100 to 2,399..... | 9.13 | 3.89 |
| 2,400 to 2,699..... | 14.38 | 3.51 |
| 2,700 to 2,999..... | 5.25 | .81 |
| 3,000 to 3,299..... | 5.52 | .69 |
| 3,300 to 3,599..... | 2.60 | .27 |
| 3,600 to 3,899..... | 1.30 | .20 |
| 3,900 to 4,499..... | 1.42 | .17 |
| 4,500 and over..... | .97 | .14 |
| 2,040 (50-52 weeks, 40 hours per week)..... | 40.30 | 30.55 |

Some further approximations had to be made in order to derive a supply index. It was necessary to make assumptions about the desired average number of hours in a workweek from information we had about the individual. Approximations also had to be made for the number of weeks worked and weeks looking for work, because only broad intervals were available. A detailed discussion of the index is provided in appendix A.

Income Variables

In this study the determination of preferences play a dominant role. But, we can talk about the ceteris paribus supply function only after individual differences have been held constant by the variables discussed in the remaining parts of this chapter. Assume for the moment that the influences of the other variables have been removed.

The individual will determine his labor supply by maximizing utility, which is a function of leisure and income. He is assumed to have no control over the wage rate he can obtain. He must decide between leisure and income when he allocates the hours in his supply period. This allocation will depend on income and substitution effects as derived in chapter III and appendix D. An individual's unearned income added to the income of other family members is introduced as a variable to measure the income effect. This variable will be known as FILOW (family income less own wage and salary income). The substitution effect can be estimated from an index based on median wages by occupation for women and an estimate of the individual's wages for adult men. The regression coefficient is estimated after netting out the income effect from this variable.

The effect of wages on the allocation of labor and leisure hours depends on the relative size of substitution and income effects. In the range where the income effect exceeds the substitution effect, the labor supply curve is backward bending. Otherwise, the supply curve retains the normal positive slope.

In figure 1 we see an indifference map which gives rise to the usual forward sloping supply curve.

A difficulty is introduced if instead of being able to measure hours of labor supplied, we are measuring whether or not an individual supplies labor or not. This difficulty can be overcome if we replace hours of labor or leisure by probability of participating and 1-probability of participating. This essentially is what we estimate when we allow the dependent variable to be 1 if the individual participates, and 0 otherwise. The regression estimate is a linear probability model. An increase in the wage increases the probability of participation if the substitution effect outweighs the income effect.

Family utility maximization is assumed in our model. However, since we assume also the cross substitution effects of leisure of the wife to be independent of the wage of the husband, we can use figure 1 to portray the income leisure choice. Point K is 0 when the spouses income is zero and the family has no unearned income or other dependent earning money.

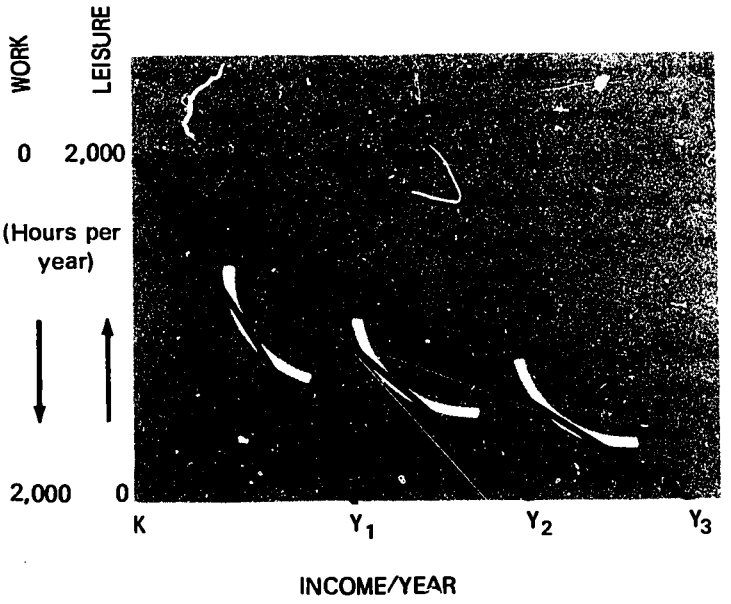
Area Variables--Review of the Literature

Another of the innovations of the present study is to introduce a number of area variables which are likely to affect the participation of individuals in the labor force. The decision of an individual to supply labor and the decision of how much to supply may depend more upon conditions in his local labor market or transportation in his neighborhood than the national unemployment rate.

Inclusion of area variables in a supply function can be defended as an extension of the family utility theory developed in chapter III which was summarized in the previous section. The participation of secondary workers is likely to depend on the wage rate that they can obtain, and also on the probability of their obtaining a job, job search costs, etc. The theoretically correct wage rate would be the expected wage rate

Figure 1.

**An indifference map yielding a positive sloped supply curve**



adjusted for search costs. Since this theoretically correct wage rate cannot be measured directly, the inclusion of the area variables improves the specification of the model. The area variables would be expected to be much less important in explaining whether or not men of prime working age (22 to 54) participate, but the variables would be expected to play a role in men's decision to look for a second job.

Because of the large number of variables in the study and because most of the area variables were defined only for 96 of the largest 104 SMSA's according to the 1960 Census of Population (which we shall subsequently call the largest 96 SMSA's), 6/ separate regressions were estimated for the individuals living in the largest 96 SMSA's.

A number of studies have taken into account area variables but have used the areas as observations. This might result in erroneous conclusions as our discussion on ecological correlation in chapter I pointed out.

Other studies (Bowen and Finegan, 1966; Cain) have been used on individual observations but have not used adequate area variables. The Bureau of the Census has released a one-in-one-thousand sample, in which the only area characteristics available are region of residence (Northeast, North Central, South and West), size of place, size of standard metropolitan statistical area and size of urbanized area. Within these categories we know if an individual lived in or outside of a central city and whether the place of residence is urban or rural. The specific labor market area in which the individual is located is not available in the sample.

One study by Morgan et. al. of labor force participation, did use an area variable for explaining variations in employment surpluses or shortages for each individual family head or wife in the sample. There

6/ The excluded SMSA's included Anaheim, Santa Ana, Garden Grove, Binghamton, Corpus Christi, Little Rock, San Juan, South Bend, Utica, Rome and York. The combined population of all of these SMSA's was less than that of the Detroit SMSA. They were excluded because they were not broken out as separate SMSA's in the CPS.

are a number of difficulties with the Morgan study and therefore it was of no surprise that their area variable was insignificant:

1. The insured unemployment rate used in the Morgan study includes only the unemployed covered by unemployment insurance and does not include all unemployed. Since there are variations in State unemployment insurance coverage, the unemployment coefficient is likely to reflect these differences in unemployment insurance coverage rather than the difference in labor market conditions.

2. The unemployment rate varies too greatly across SMSA's within a State to be a good indicator of the employment opportunities facing a particular worker. To demonstrate that the intrastate variation exceeds the interstate variation in unemployment, we tabulated the unemployment rates in the largest SMSA's for 1960, a year after the Morgan study was carried out. We used a measure of unemployment which incorporates adjustments for differences in unemployment insurance coverage. The range presented in this comparison probably understates the variance of unemployment within States because it includes only the 150 largest SMSA's in the United States. Table 2 shows the rates for States where data were available for five or more SMSA's.

The range in the State unemployment rates shown, excluding Pennsylvania, was 5.3 to 6.7. The range within each of the States shown was at least as great as the range among States. In Pennsylvania, the State rate was much higher, 8.0, but the range within Pennsylvania was 3.9 - 12.9.

3. Even though the States cooperating with the Bureau of Employment Security attempt to derive accurate measures of unemployment, the estimates have been subject to serious question (Ullman; Lindauer; and Flaim). 7/ A measure of unemployment calculated directly from the CPS was used for most of our estimates.

7/ For a discussion of the conceptual differences between BES unemployment rates and unemployment rates computed for the 20 largest metropolitan areas from the Current Population Survey, see Paul O. Flaim, "Jobless Trends in 20 Large Metropolitan Areas."

Table 2. Inter- and intrastate variation in total unemployment rates by State, 1960

| State | Range in rate between SMSA's in State 1/ | State rate |
|---|---|---|
| California..... | 5.1 - 7.0 | 5.8 |
| Connecticut..... | 2.9 - 7.6 | 5.6 |
| Georgia..... | 3.7 - 6.0 | 5.8 |
| Massachusetts..... | 4.1 - 8.2 | 5.4 |
| Michigan..... | 4.2 - 7.8 | 6.7 |
| New Jersey..... | 5.8 - 7.2 | 6.7 |
| New York..... | 4.4 - 7.0 | 5.6 |
| North Carolina..... | 3.9 - 5.9 | 5.5 |
| Ohio..... | 6.2 - 7.8 | 5.5 |
| Pennsylvania..... | 3.9 -12.9 | 8.0 |
| Texas..... | 4.1 - 8.2 | 5.3 |

1/ Included in this range are only the largest SMSA's in the State as reported in The Manpower Report of the President, 1967 (pp. 260, 263-265). One-hundred fifty SMSA's were included for all States, territories, and the District of Columbia.

4. Jacob Mincer (1966) has suggested that variations in SMSA unemployment rates may largely reflect longrun structural conditions rather than shortrun cyclical variations. Thus, the unemployment rate may not be an ideal measure of area labor surpluses or shortages.

5. The unemployment rate of the SMSA may not adequately reflect employment opportunities for all individuals in the SMSA. Persons living in ghettos may be trapped in the ghetto due either to lack of transportation or imperfect labor market conditions. The growth in employment and reduction in unemployment may take place in the suburbs of an SMSA so that the central city resident or ghetto resident may face entirely different market opportunities.

Area Variables Used in the Study

The area variables used in our study will overcome many of these objections. Most of the area variables are used only for the persons in our sample living in the 96 largest SMSA's. These SMSA's made up slightly more than 50 percent of both the population and employment in the United States in 1967.

The area variables used in our sample are: (1) Unemployment rate of the area; (2) change in employment; (3) whether or not the individual lives in a poverty tract; (4) personal income per capita of the SMSA; (5) South, non-South; (6) whether the composition of employment is favorable to women or youth; and (7) whether or not the individual lives on a farm. The first three variables and interactions between them were included in regressions discussed in each subgroup of the population. The remaining variables are used only for certain groups.

Of the seven area variables, four were constructed only for the largest 96 SMSA's. These four were: Unemployment rate, employment change, personal income per capita, and the composition of employment.

Unemployment Rate. The unemployment rate of an SMSA reflects many long-run influences operating within the SMSA. The annual average unemployment rate was computed directly from the CPS data for 1966.

The unemployment rate of the SMSA is an indication of how difficult it is for residents of the SMSA to find a job. The higher the unemployment rate in the SMSA, the more difficult it is for the individual to find a job, and the more likely he will participate in the labor force.

Changes in Employment Opportunities. Using employment data collected by State Departments of Labor and published by the Bureau of Labor Statistics in Employment and Earnings Statistics for States and Areas, we computed percentage changes in employment by year and month for the 96 SMSA's in our sample. 8/ A few minor imputations were made to provide a consistent series.

Changes in employment are more likely to reflect shorter-run changes in employment opportunities than the unemployment rate. The unemployment rate is likely to reflect long-run structural factors. An increase in the labor force of an SMSA might keep the unemployment rate of a community high for several years. (See Mincer, 1966.) The change in employment is more likely to reflect shorter-run changes in demand opportunities.

Like the unemployment classification, the employment change variable is a measure of job opportunities. The lower the employment change, the fewer opportunities facing the individual, ceteris paribus, and the more likely it is that the individual will not be in the labor force.

The inclusion of an employment change variable in addition to an unemployment variable can be justified on other grounds.

Flows into unemployment result from layoffs, quits, and new entrants. Edward Kalachek (1966) has pointed out that the composition of unemployed among these groups depends on the path as well as the level of unemployment rates. A constant 4-percent unemployment rate

8/ Employment and Earnings Statistics, for States and Areas, 1939-1967 (BLS Bulletin 1370-5, 1968).

over time produces a lower percent of layoffs and a higher percent of quits and new entrants among the unemployed than a 4-percent unemployment rate reached through an unstable path of unemployment rates. Percent changes in SMSA employment do not reveal the precise path by which a given SMSA unemployment rate was reached. However, given the unemployment rate in the SMSA, a high percent increase in SMSA employment probably benefits new entrants more than those susceptible to unemployment through layoffs. Thus, the employment change variable improves the specification of actual employment conditions faced by each labor force group. Since prime-age men (age 22-54) compose a large proportion of layoffs while youth and women make up much of the new entrant group, we expect high employment change to increase labor force participation among youth and women more than among men.

One could imagine two areas with a high unemployment rate, but different employment changes. In one area, employers are not hiring. In the other area, employment has picked up considerably so that employers are hiring vigorously. One would want the employment opportunities variables to reflect the difference in these two areas.

Theoretically it would be better to use job vacancies as a measure of available jobs. However, vacancy data are available for only a few SMSA's in our sample. 9/

A related justification for the inclusion of employment change is the finding of Cohen and Solow (February 1967) of the significance of both new hires and the unemployment rate in explaining the behavior of help wanted advertising, which they examined as a possible proxy for job vacancy data. The new hires variable would be correlated with employment change cross sectionally. Thus, the inclusion of both employment change and the unemployment rate would give a rough indication of job vacancies cross sectionally.

9/ For a survey of some recent developments in job vacancy statistics, see Konstant and Wingeard (1968).

Employment change was divided into three intervals: Low, medium and high. Each chapter (III through V) defines these intervals slightly differently.

Neither the unemployment rate nor the employment change variables were computed from the same survey data as the participation rate data. The unemployment rate data came from an average of 12 monthly CPS surveys conducted in 1966. All three dependent variables came from the March 1967 survey. The employment change variable came from an entirely different data source--total nonagricultural employment as reported by firms in the BLS establishment data program.

Residence in a Poverty Tract. A number of studies, especially Mooney's, have indicated that individuals living in poverty tracts would have an expected labor force participation below that of other persons. A poverty tract is defined on the basis of socioeconomic characteristics of persons living in the tract, according to the 1960 census. See appendix B for a detailed description.

Persons living in poverty tracts have less education and training on the average than the nonpoverty tract residents. But they also have less adequate transportation, less adequate information about jobs, and they face discrimination in hiring. The situation is compounded by the rapid increase in job opportunities in the suburbs and the slow increase of growth in employment in central cities.

In a study of 12 of the largest SMSA's, Dorothy Newman found that total payroll employment in all SMSA's increased by an average 12 percent from 1959-65 while employment outside of the central city of the SMSA increased by 30 percent. 10/

The lack of adequate job information and transportation are two of the reasons that employment conditions in the poverty tract may be a more accurate indication of employment opportunities than the SMSA unemployment classification.

10/ Newman, pp. 7-13.

Poverty area residence may also influence labor force participation through relative income considerations. A given income may have different effects on participation for those who live in poverty tracts than for those who live in a higher income area.

Personal Income Per Capita. Since prices differ between regions, income should be adjusted for price differences. This creates several difficulties. The first is the index number problem. Consumers across areas have heterogeneous bundles of goods plus savings which cannot be compared without a unique set of quantity weights. Even if we assumed that differences in area consumption patterns arise only because of price differences, there is a different price index for every area and income level. There is also the problem of adjusting savings. If we allow for differences in area consumption patterns because of different climates and consumption opportunities, there is no basis for comparison because we are, in effect, comparing individuals with different preference patterns.

Because of these problems, dealing with relative income is indicated. In the spirit of Duesenberry, we hypothesized that labor supply decisions are affected by a demonstration effect. The extent of contact with those earning higher income will determine an individual's earnings expectations. In addition to the income variables discussed earlier, mean per capita personal income within the SMSA will be added. 11/

South, Other Areas. Whether or not an individual lives in the North or the South is a proxy variable for a number of variables that cannot be quantified easily, such as the vast agricultural underemployment and the different historical development in the South. Ideally, if all these factors were reflected in our model, the coefficient of this variable would be insignificant.

Composition of Employment Variable. A composition of employment variable is used to measure the relative employment opportunities

11/ Graham and Coleman, pp. 32-37. The data are on a place of residence basis.

facing either adult women or youth in the SMSA of residence of the individual. This variable is needed in addition to the overall unemployment and employment change variables since the opportunities facing secondary workers are likely to be different even in areas with the same overall employment opportunities. The form of this variable is the same for both groups although we are concerned with the relative opportunities for adult women in chapter IV and the relative opportunities for youth in chapter V.

If the occupational or industry employment composition in an area is favorable to women or youth, we would expect a higher participation of youth or women in the labor force in this area.

A number of alternative variables which we debated using to measure the relative employment opportunities of either youth or women are listed below:

1. The percent of employment in each area in industries with a high national composition of women or youth.

2. A weighted average of the employment in each area weighted by the national percentage of women in each industry.

3. The ratio of employment to population of women or youth to the total employment-population ratio in the SMSA.

The third alternative was chosen after a careful consideration of the theoretical issues discussed below.

Alternatives one and two are similar, although two is more precise than one. They both use national patterns to determine industries with a favorable composition of women or youth by SMSA. The primary difficulty with the first two measures is the large variation in female employment within the broad industry groups that are available for constructing the index. For example, Cain (1966) used the percent of the labor force in an SMSA in industries demanding primarily males. The industries he chose were: Mining, construction, agriculture, forestry and fisheries, business and repair services, transportation

and communication and durable manufacturing. Of these six industries, over half of the SMSA employment was in durable manufacturing. We tabulated the distribution of the percent of women within 65, three digit, durable goods industries for 1966 based on national BLS establishment employment data. While the average percent of women in all durable goods manufacturing was 19 percent, 21 of the durable goods three digit industries had over 25 percent female and six even had over 50 percent female.

Since a number of SMSA's had a high concentration of female intensive durable goods industries while other SMSA's had low female intensive durable goods industries, measures one and two are not good indices of opportunities available to women.

Even within three digit industries, variations exist in the percent of women employed. For example, during 1966 32 percent of the employees in the lighting fixtures industry were women compared with 66 percent in the electric lamps industry.

In addition to the aggregation problem discussed previously, an area may have a larger proportion of women working due to a greater population of women in the area rather than better opportunities.

To avoid these problems, we used the third measure of relative opportunities: $(E_{if}/P_{if})/(E_i/P_i)$, where $E_{if}$ is the employment of women in the ith SMSA, $P_{if}$ is the female population in the ith SMSA, and $E_i$ and . are the employment and population of all persons in the ith SMSA (16 and over).

The major difficulty with our employment opportunity variable is that it appears to be a tautology. If our relative opportunity variable were the average participation of women in each SMSA, $(L_{if}/P_{if})$, its coefficient would be one and we would have explained nothing.

The numerator of our variable, $E_{if}/P_{if}$, is likely to be highly correlated with $L_{if}/P_{if}$ because E is such a large component of L (the size of the labor force). The correlation between $E_{if}/P_{if}$ and $L_{if}/P_{if}$ was

.9877 for the 96 SMSA's using a 1966 annual average. The correlation between $(E_{if}/P_{if})/(E_i/P_i)$ and $(E_{if}/P_{if})$ was .8485. This is still a high correlation; however, it is due in part to the fact that the same respondents were common to both ratios. To avoid this problem and better reflect the appropriate economic lag, the relative opportunity variable was calculated from twelve monthly CPS surveys during 1966, while the dependent variable was based on a March 1967 survey. This took us an additional step away from a tautology. Also, the relative opportunity variable was a categorical variable (low, medium and high opportunities) rather than continuous. Finally, the measure is calculated for the ratios of all women 16 and over to all persons 16 and over in the SMSA. The universe of the regressions include only a subset of all women over 16.

Women or youth are classified as being in either low relative opportunity, medium relative opportunity or high relative opportunity SMSA's. If relative opportunities for women were less than 62 percent or greater than 74 percent, they were classified as in the low and high relative opportunity SMSA's, respectively. If relative opportunities for youth were less than 72 percent or greater than 90 percent, they were classified as in the low and high relative opportunity SMSA's, respectively.

Farm, Nonfarm. Residence on a farm increases the changes that a given individual participates in the labor force. A job working on the farm is easily accessible to farm residents. There is no need to compete in the labor market for many of these jobs since family workers make up nearly three-fourths of total farm employment. For this reason, unemployment rates of farm workers are lower than the overall rate, and few farm residents are subject to the discouragement of looking for, but not finding a job.

Area Variables - Their Values

Appendix C presents the values of the area variables for each of the 96 SMSA's used in our sample. Because of the large sampling variability in the CPS unemployment rates and relative opportunity variables, the exact values of these variables were not published but only the categories used in the regression are shown. Appendix C also describes how the SMSA's used in the table differ from the 1967 Bureau of the Budget definitions.

Family Variables

Family variables play an important role in the regressions for youth and women. Age, number of children, and marital status of women have an extremely important effect upon their labor force participation. For youth, whether or not they are living at home also has an important effect on their labor force participation. For adult men, the absence or presence of a spouse may have an effect on labor force participation. These variables are discussed further in chapters III through V.

Demographic Variables

The demographic variables explaining the largest variation in labor force participation are age, sex, and race. Labor force participation rates have been cross tabulated by these variables since 1948.

Labor force participation is greatest for men in the prime working ages and lowest for youths and older people. Women participate less than men since women take time to keep house and take care of children. A comparison of white and Negro and other participation rates can be misleading unless account is also taken of the interaction between sex and race. White women participate less than other women, but white men participate more than other men.

In chapters IV and V, whites and all others are compared. In chapter VI, Negroes only are included in the regressions.

Table 3 presents civilian labor force participation rates of all persons 16 and over by age, race and sex in 1967.

Projections of the labor force have also been based on these basic demographic factors. 12/

Ability and Motivation Variables

Ability and motivation are extremely important determinants in the decision to supply labor. Unfortunately, our measures of these variables are inadequate for many reasons.

For all adults, educational attainment is a crude measure of ability because: (1) It reflects only a particular type of formal training. It excludes on the job training, supplementary vocational training and adult education courses. (2) There are differences in the quality of education offered in different schools. (3) Differing curricula of schools of equal quality may not prepare students equally for a vocation.

Using a 1965 survey, James S. Coleman showed that the average Negro high school senior is performing at a ninth-grade level while the average white high school senior is performing at better than the twelfth-grade level. These differences reflect inequality of opportunity as well as motivation. Motivation reflects housing, parents' attitudes and many other factors for which we have imperfect measures.

The race variable and residence in a poverty tract variable reflect some of the factors underlying differences in motivation.

12/ See Cooper and Johnston, Bancroft, and U.S. Bureau of the Census, "Summary of Demographic Projections," Current Population Reports--Population Estimates, P-25, No. 388, March 14, 1968.

Table 3. Labor force participation rates by age, sex and race, 1967

| Race and age | Men | Women |
|---|---|---|
| Whites | | |
| Age 16 to 24 years..... | 69.6 | 48.0 |
| Age 24 to 64 years..... | 94.5 | 44.9 |
| Age 65 years and over..... | 27.1 | 9.3 |
| Negroes and others | | |
| Age 16 to 24 years..... | 67.5 | 44.9 |
| Age 25 to 64 years..... | 90.9 | 57.2 |
| Age 65 years and over..... | 27.2 | 13.0 |

## Chapter III. Labor Supply of Adult Men

Labor force participation of adult men is taken for granted by our society. This is reflected in the participation rates for the prime-age group, 25 to 54 years, which averaged 95.4 percent in 1967. 13/ Nevertheless, the absolute number of persons in this age group who do not participate is significant, and they are worthy of investigation. Supply decisions are more complex for older men because of the general acceptance of retirement. Social Security benefits and private pensions make nonparticipation possible for this group.

It is easier for men to vary the amount they work than to stay out of the labor force altogether. Therefore, in this chapter most attention is given to the continuous supply function. The shape of this function is of considerable interest for those analyzing the effects of tax and transfer plans on work incentives.

The supply model for men includes most of the variables discussed in chapter II. These were income, area, family, demographic, ability and motivation variables. This chapter outlines the theory behind the income, family and age variables before proceeding to the empirical results.

### Income Versus Leisure

The theory of individual behavior will be applied to the choice between work and leisure. It is assumed that work is undertaken for the income received and that the individual maximizes his utility which is a function of present and future consumption and leisure. Gary S. Becker (1965) emphasizes the simultaneity of consumption and leisure decisions by introducing goods that must be combined with time in order to give utility. Our model is simplified by ignoring the effects of changes in relative prices of consumption goods on the preferences between income

13/ Waldman, p. A-6 (1968).

and leisure. However, Becker's theory can give us added insights about labor supply when we interpret our results.

Since income is usually shared within a family, the labor supply decision of each family member must depend on the other family member's income contributions. This interdependence could take many forms, but it seems reasonable to assume that the family acts as a single decision making unit. (Kosters, Mincer 1962, Samuelson) The family's ordinal utility function will contain as arguments family income and the amount of leisure for each family member. The leisure of a dependent who is not likely to work under relevant circumstances can be assumed to be a constant equal to the number of hours in the supply period. The problem of how the utility function is formed is essentially the same as that of determining a social welfare function. This problem is neglected since the special nature of family ties leads us to believe that families act as if they have such a function.

Consideration is first given to a model in which the family consists of only two potential income recipients, the husband and the wife. This model is later generalized. At the present we ignore taxes, whose effect on work effort will be examined later in the chapter. Under these assumptions, the family utility function contains the leisure of the husband and the leisure of the wife, as well as total family income. The techniques of utility maximization from the theory of the consumer are applied.

$U(I,H,S)$ = Utility as a function of family income (I), hours of husband's leisure (H), and hours of wife's leisure (S)

We maximize $U(I,H,S)$ subject to the time and income constraint:

$(T-H)W_H + (T-S)W_S + Y = I$

$W_H$ = Husband's wage rate

$W_S$ = Wife's wage rate

T = Total hours in supply period

Y = Family unearned income

The first order conditions for maximization tell us that the marginal rate of substitution between income and leisure equals the wage rate. From this we derive the labor supply equations for the husband and the wife. (See appendix D.) Both equations are a function of the husband's and the wife's wage rates and family unearned income. If we assume that the leisure of the husband and the wife are neither substitutes nor complements but are independent in the utility function, the supply equations reduce to:

Supply of husband's labor = $F^H(W_H, (T-S)W_S + Y)$

Supply of wife's labor = $F^S(W_S, (T-H)W_H + Y)$

The supply of labor for husband and wife are arrived at simultaneously, but we treat the earnings as given along with unearned income. As shown in appendix D, the coefficient of the variable $(T-S)W_S + Y$, or FILOW (Family Income Less Own Wage and Salary Income), is the income effect for the husband. The substitution effect for the husband can be calculated from the total response to a wage change (the coefficient of $W_H$) and the income effect.

This model can be extended to include larger families. If every family member's leisure is independent, each member's supply will depend on his wage and other family income, which in the general case is total family income less the individual's earnings. The income effect is the coefficient of FILOW.

The same supply equations result from alternative approaches to decision making in a family. One such alternative is the inclusion of the dependent's utility in the head's utility function. If appropriate cross substitution effects are assumed to equal zero, it can be shown that the supply function for each family member is a function of his wage and FILOW.

In the derivation above, the problem of unpaid work in the home was ignored. This is particularly important for the wife. She must allocate

her time between income, leisure and work at home. There are two possible ways to treat house work. The first is to include it as part of income in the utility function by imputing a wage for it and allocating the wife's time between the three activities. Cain implicitly uses this approach in his theoretical model and uses the presence of children as an indication of a higher home wage for house work.

The second approach is to put homework in the utility function along with the leisure variables and market income. We can then deal only with the substitution between paid employment and hours spent in the home, however divided between work and leisure. The wife's "leisure" is therefore a measure of both work at home and leisure, and the allocation of time within the home remains unobserved.

There has been a great deal of interest in the possibility of a "backward-bending" supply curve of labor. It is said that for high wage rates the amount of labor supplied will diminish as wages increase. This can occur if leisure is a superior good and the income effect is sufficiently large to offset the substitution effect. Since Douglas' early work, empirical evidence has tended to support the existence of a negatively sloped or at least perfectly inelastic supply curve for labor. H. Gregg Lewis indicated that secular decreases in both the length of the workweek and the participation of men support a negatively sloped supply curve. Our study sheds further light on the elasticity of labor supply of men.

The wage variable needed to separate the income and substitution effects was estimated by dividing the individual's total earnings for 1966 by an estimate of the number of hours which he worked. (See appendix A.) The use of dummy variables for wage intervals should reduce problems caused by errors in this variable. The resulting distribution of wages is given in table 4 for men age 22 to 54.

Table 4. Estimated average wages in 1966 for men age 22 to 54

| Dollars per hour | Percent of those supplying labor |
|---|---|
| Total | 100.00 |
| $ 0 - $0.49 | 2.73 |
| $ 0.50 - $0.99 | 3.70 |
| $ 1.00 - $1.49 | 6.66 |
| $ 1.50 - $1.99 | 10.16 |
| $ 2.00 - $2.49 | 12.17 |
| $ 2.50 - $2.99 | 14.70 |
| $ 3.00 - $3.49 | 13.71 |
| $ 3.50 - $3.99 | 11.28 |
| $ 4.00 - $4.49 | 7.14 |
| $ 4.50 - $4.99 | 5.37 |
| $ 5.00 - $5.49 | 2.94 |
| $ 5.50 - $5.99 | 2.26 |
| $ 6.00 - $6.49 | 1.59 |
| $ 6.50 - $6.99 | 1.11 |
| $ 7.00 - $7.49 | .97 |
| $ 7.50 - $7.99 | .71 |
| $ 8.00 - $8.49 | .48 |
| $ 8.50 - $8.99 | .40 |
| $ 9.00 - $9.49 | .27 |
| $ 9.50 - $9.99 | .32 |
| $10.00 and over | 1.33 |

Since the wage variable could not be calculated for those who did not work during the previous year, it was included only in the regressions which explain the continuous supply of hours. In the labor force participation equations, the education variable can be interpreted as a combined taste, skill and market wage variable.

The Family

The definition of the scope of the family unit has two effects on the supply function. Since we treat the family as a decision making unit, the family includes all those who might work and whose leisure is in the family utility function. In addition, the family includes all those who are dependents. Account must be taken of the fact that a large family has more income if there are more income recipients, but it also has more people to support than a small family.

In the regressions reported here, all adult men are included in one equation regardless of marital status or family size because there are more similarities than dissimilarities between married and single men. Differences are taken care of by family variables described below and their interactions with other variables.

The presence of dependents will be indicated by several dummy variables. Dependent children, limited here to those under 18, are expected to increase the family's need for income and therefore, increase the male's labor supply. We do not use the number of children because of differences in the "quality" of children suggested by Becker in 1960. For instance, higher income groups impute a higher cost of raising children because they feel that they must send them to college. The wife's income is included in the husband's supply function, but we also count her as an additional responsibility with a "married, spouse present" variable. The wife probably also affects the tastes of the husband (or men with different tastes are likely to be married). Dorfman and Steiner find the presence of a wife to have a strong positive

effect on the participation of the husband. They point out that the wife's presence is strongly correlated with the man's subjective appraisal of whether he is well enough to work. This is a good example of how complicated the interpretation of many of these variables can be.

One would expect there to be many older people who are supported by their relatives. Regular payments from relatives not living in the same household are included in our income data, but this type of payment may be underreported. Dependency most likely takes the form of room and board, but the extent of this type of arrangement has been secularly declining. Morgan estimates that only 11.2 percent of adult units in this country were dependent in 1959. Therefore, complicated family ties within the household are not a major problem, but we will include in the family decision making unit all related individuals who are living together.

Age

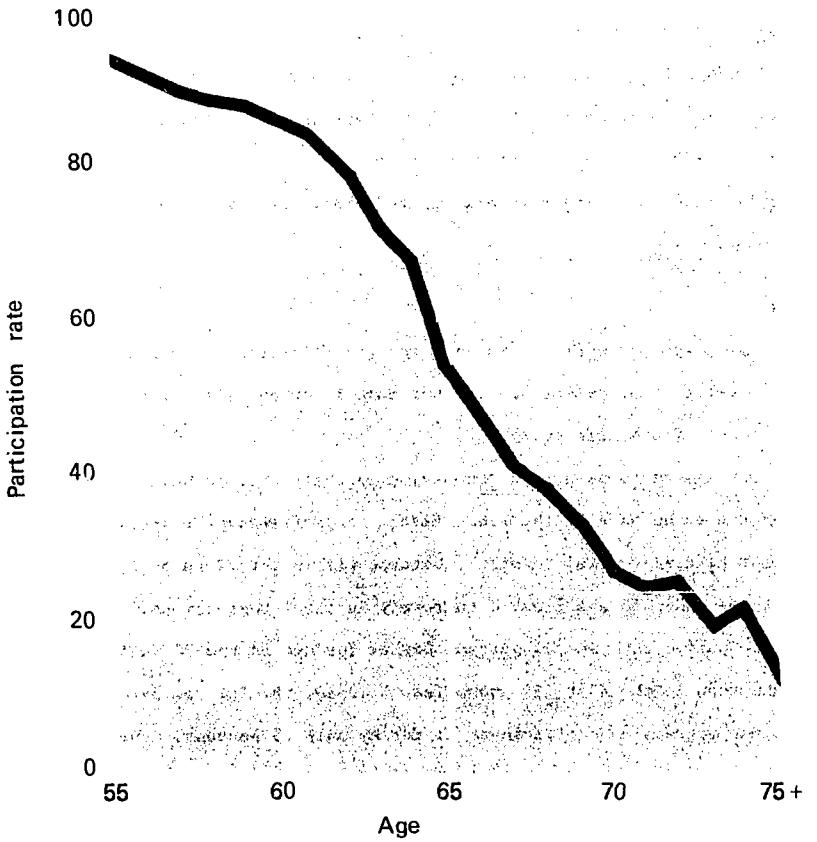
Age plays an important role in the participation decision. It has an effect as a proxy for health, but more importantly it groups people in stages of the life cycle.

Men age 22 to 54 are in the period in their life in which they are expected to be part of the labor force. A preliminary regression showed almost no differential between subgroups within the 22 to 54 age group, so those under 55 are treated uniformly in final regressions. The participation rate is 2.2 percent higher for men in the 30 to 44 age group than in the 45 to 54 group (see Waldman, op.cit., p. A-6, 1966), but the regression coefficients differ by only .3 percent. The difference is probably accounted for by increased unearned income and lower education levels in the older group.

Beyond the age of 55 there is a steady decline in participation. (Chart 1.) This reflects general health, but also work opportunities for older workers. Employers are not willing to provide training and

Chart I.

## Labor force participation rates of men 55 and over 1966 annual average



retirement plans when the worker will only remain in the labor force a few years, and older people tend to have obsolete skills.

Public and private retirement plans make retirement feasible, so the age brackets were chosen with retirement provisions in mind. At age 62, reduced Social Security benefits can be received while full benefits are received for those who retire at 65. Those under 72 face a retirement test that reduces Social Security benefits when earnings exceed $1,500. 14/ This should reduce the hours supplied by those whose benefits are being reduced. Therefore, the oldest age bracket starts at 72. In regressions which explain supply during the year 1966, the brackets are adjusted upward by 1 year since the age reported is for March 1967. In a static framework there should be no additional effect of social security on March participation since the benefits are included in the income variable. However, a small reduction in March participation will occur if those affected by the benefit reduction stay out of the labor force for a few months of the year instead of reducing the number of hours worked in each month. In addition, there will be a life cycle effect. People plan to work until a certain age and then retire. Their preferences for work during a year change when they reach these conventional retirement points.

Participation in the Labor Force--Results

Because many of the more important issues concerning labor force participation of men involve area employment opportunities variables, attention was concentrated on the participation of men in the 96 largest SMSA's. This group contained 55 percent of the men in the entire sample. Separate regressions were run for men age 22 to 54 and 55 and over. The results are reported in appendix tables F-1 and F-2. The results for participation during the year were nearly the same as in March, so this dimension of labor supply is not presented for men. A few variables were

14/ This income level applied in 1966. There is also a monthly test.

eliminated in the two preliminary regressions, and these will be discussed below.

FILOW is highly significant. Increased income reduces the probability of participation as expected, but the responses differ according to age and marital status.

For single men age 22 to 54, the effect of FILOW on participation appears to be small after reaching an income of $2,500 a year. For married men, the decline is more gradual and not nearly as large. This is shown in table 5, where the interactions between marital status and income variables have been added together. 15/ The presence of a wife means a much higher probability of participation. There are many explanations for this, such as the need to support a family, the social pressure for the head of a household to work, and family pressures to actually look for a job when out of work. The causation might be reversed to some extent since a man who is out of the labor force is not as likely to get married. The effect of having a family is not as large for those with no other income because earned income is needed for support.

The effects of additional income are much more pronounced for older men. Both married and unmarried men 55 and over will not be likely to participate if other income makes nonparticipation possible. There is little additional decline in participation once other income goes beyond $1,500. There is a slight upturn for married men, but the differences are not statistically significant. Possibly, those in the $1,500 to

15/ For the reader unfamiliar with multiple regression analysis involving dichotomous dependent variables, two cautions should be stressed involving the interpretation of table 5. First, the rates shown in the table would only equal the average rates for all adult men if all the factors and interactions were also held constant at the average for the population. This was not the case in our example. Second, it is possible that the calculated participation rates shown in table 5 could turn out negative, as did age 72 + FILOW = $5,000, if extreme values of the variables to be held constant were picked. Negative calculated values indicate that not all interactions have been accounted for. If important interaction effects are omitted for a moderately large class of men, it would be a reasonable criticism of the regression to say that a particular interaction was omitted. However, if the regression incorrectly predicts the labor force participation of a few men in the population who have an unusual combination of characteristics, no one will be concerned. As additional research is carried out, the specification of interactions will be further improved. These techniques are discussed further in appendix E.

Table 5. Participation rates by income, age and marital status - other factors constant 1/

| Total family income less male's earnings (FILOW) | Single or spouse not present | Married, spouse present |
|---|---|---|
| | Age 22 to 54 | |
| 0 - $499 | 91.8 | 94.6 |
| $500 - $999 | 85.0 | 94.6 |
| $1,000 - $1,499 | 80.5 | 93.0 |
| $1,500 - $2,499 | 83.0 | 92.9 |
| $2,500 - $3,999 | 76.7 | 92.3 |
| $4,000 - $5,999 | 82.7 | 92.0 |
| $6,000 - $7,999 | 76.6 | 91.8 |
| $8,000 and over | 74.8 | 89.8 |
| | Age 55 to 59 | |
| 0 - $499 | 98.0 | 98.0 |
| $500 - $1,499 | 73.4 | 87.0 |
| $1,500 - $2,999 | 66.3 | 74.3 |
| $3,000 - $4,999 | 69.1 | 77.5 |
| $5,000 and over | 66.2 | 79.9 |
| | Age 72 and over | |
| 0 - $499 | 51.7 | 51.8 |
| $500 - $1,499 | 8.6 | 22.2 |
| $1,500 - $2,999 | 1.7 | 9.6 |
| $3,000 - $4,999 | 0.2 | 8.6 |
| $5,000 and over | 0 2/ | 13.0 |

1/ Predictions from regressions in appendix tables F-1 and F-2 for 0-7 years' education, medium employment change, non-South, non-poverty, and under 3.5 percent unemployment rate, March 1967.

2/ We rounded the predicted value of -0.7 to 0. See footnote 15 in the text.

$4,000 range receive social security benefits. Because of the retirement test for those age 62 to 71, anyone receiving sizable benefits is not likely to be earning very much and is not as likely to be participating.

The probability of participation declines as age increases. The interactions between age over 72 and income show that for this group, where nonparticipation is socially acceptable, the effect of additional income is greatest. One additional reason for this result is that we have no data on assets. Older people need less income because they can use principal to finance retirement, and they are more likely to have assets such as consumer durables and a home.

In the two preliminary regressions it was found that the effect of race was nearly zero and was clearly not significant. This is interesting because previous studies (Bowen and Finegan; Parker and Shaw; and, Mooney) based on aggregate data tend to conclude that discrimination and low skill levels tend to discourage participation by Negroes and others. 16/ By controlling for other factors, such as education, the difference has been eliminated. This same result held in the one regression which was run for participation during the year. It is still possible that during a period with generally high levels of unemployment, the participation rate for persons other than whites may be lower ceteris paribus because discouragement effects will be greater if they are the first ones to be laid off and the last ones to be hired.

Residence in the South showed no effect in any of the participation regressions. This supports the finding of Bowen and Finegan (1966).

It was hypothesized that residence in a poverty tract might adversely affect participation because of poorer opportunities and lower aspirations. This appeared to be the case for men under 55 years of age. The poverty variable is significant at the 10 percent level. The results are not as clear for older men. The coefficient is near zero. However, the interactions with the February to March employment change

16/ Mooney reports that Negro men in poverty tracts have higher participation rates than whites, but he has not controlled other variables (pp. 104-119).

are more significant. For the younger group, the interactions are of the opposite sign and not significant, and the noninteraction poverty tract term is significant. Therefore, the effect of residence in a poverty tract for older men may have been picked up in the interaction term.

The apparently weak interaction between residence in a poverty tract and employment change does not contradict Mooney's suggestion that the poor are more sensitive to improvements in employment opportunities because here we are looking at the independent effects of living in a poor area. Although Mooney's observations are poverty tracts, we assume that the different responses which he observed were intended to reflect the characteristics of the poor, such as low educational attainment, and not the place of residence. This is another example of how micro economic data allows more careful specification and estimation.

Educational attainment has a large impact on the ease with which a person obtains a job. This is because education reflects ability and motivation and is used as a screening device by most employers. It also reflects one's tastes for work and the kind of job, but it is hard to say in which direction on the taste effect might be. Orcutt concludes that the taste effect of education is not important for men.

As was found by Bowen and Finegan (1966), education level is positively related to participation. However, this effect is strongest for older men. Older men with a graduate school education are much more likely to participate than those with less education as shown by the interaction terms.

For those in the prime-age group there is a slight decrease in participation for those with more than a high school education. This is in part because some of this group are still in college, so this result is not very meaningful. Nevertheless, when we come to the continuous supply variable where those in school have been left out of the regression we still observe a small effect of education between 12 years

and 13 to 15 years.

Since overall unemployment was 3.8 percent in 1967 and 5.5 percent in 1960, 17/ there will be a greater positive effect of education on participation in studies which use 1960 census data because of greater discouragement effects for those with the least education.

Unemployment and employment change have the expected effects. On the whole there is no important effect of the unemployment rate until it reaches 5 percent. The effects are weak for prime-age men. The highest unemployment rate coefficient is not quite significant at the 10 percent level. The employment change effect is even smaller but of the right sign. The discouragement effect on older men is much stronger. Participation rates are predicted to be 6.8 percent lower in SMSA's with more than 5 percent unemployment than in SMSA's with less than 3.5 percent unemployment. The employment change variable is also significant. An older man with less than 8 years of education will have a probability of participation 10.7 percent lower in a high unemployment rate and low employment change SMSA than in a low unemployment and high employment change SMSA. This is cross section evidence of hidden unemployment.

One regression not shown in the appendix was run with five unemployment rate categories, but the results were the same: The discouragement effect is small in areas where unemployment rates are under 5 percent.

Interactions between education and the area unemployment rate were specified. They were statistically significant only for those over 55, but the results for both are summarized in table 6. The coefficients are erratic for those with over 12 years of education. It appears that high unemployment rates have the most certain effect on those with the minimum education and on older men. This would explain Mooney's results. Poverty tracts have a higher proportion of older people and those with lower education, so the participation rate response to unemployment would be greater in these areas.

17/ Handbook of Labor Statistics, 1968 (BLS Bulletin 1600), p. 22.

Table 6. Participation rates by years of schooling, age and SMSA unemployment rates - other factors constant

| Years of schooling | SMSA unemployment rate | | |
|---|---|---|---|
| | Less than 3.5 | 3.5-4.9 | 5.0 and over |
| | Men age 22 to 54 1/ | | |
| 7 years or less | 93.1 | 93.4 | 90.8 |
| 8 to 11 years | 97.3 | 98.0 | 97.2 |
| 12 years | 100.0 | 99.9 | 98.8 |
| 13 to 15 years | 96.3 | 97.9 | 95.0 |
| 16 years | 98.6 | 97.3 | 98.9 |
| 17 years and over | 96.1 | 95.4 | 96.9 |
| | Men age 55 to 59 2/ | | |
| 7 years or less | 77.0 | 73.9 | 70.2 |
| 8 to 11 years | 78.9 | 78.6 | 75.1 |
| 12 years | 84.1 | 82.8 | 79.3 |
| 13 to 15 years | 82.6 | 88.9 | 83.3 |
| 16 years | 83.2 | 94.9 | 79.3 |
| 17 years and over | 80.7 | 88.5 | 89.6 |

1/ Predictions from regressions in appendix table F-1 for married, spouse present, non-South, nonpoverty, medium employment change, $1,000 to $1,499 FILOW, March 1967.

2/ Predictions from regressions in appendix table F-2 for married, spouse present, nonpoverty, medium employment change, $1,500 to $2,999 FILOW, March 1967.

It is not surprising that the effects of unemployment rates on college-educated men show no definite pattern. This group's employment patterns are very insensitive to overall economic conditions: they have first chance at jobs which do not require a specific skill. They are probably more mobile between SMSA's. Therefore, the unemployment rate is not a good measure of their employment opportunities.

Several time series studies (Strand and Dernburg; Tella, 1964 and 1965) have established that the labor force participation rate increases with short-run increases in employment. Our estimates of the participation rate response to unemployment change are compared to those of Dernburg and Strand in table 7. The latter, which are based on monthly observations, have been converted to participation rates. The cross section responses in this study are generally much higher. There are three explanations for this. The first is that the division of SMSA's by annual unemployment rates separates areas by relatively long-term employment conditions. Discouragement effects are greater if poor opportunities have prevailed for a longer period.

The second explanation for the smaller time series response is that our micro data enable us to control for earnings of other members of the male's family. As employment conditions deteriorate and other members of the family lose jobs or otherwise experience reduced earnings, the man must participate to support the family. This will reduce the discouragement effect which is observed in time series data. If the earnings of other members remain the same, the man has less urgency in looking for a job. The discouragement effects which we observe while holding other family members' earnings constant will therefore, be larger even if there is no difference between the short and longrun.

The third reason for the higher cross section estimates is that migration can occur from high to low unemployment SMSA's as an alternative to labor force withdrawal. 18/ This would increase the apparent cross section response but would not affect the time series response.

18/ See Mincer (1966), op. cit., pp. 73-112.

Table 7. Participation rate response to unemployment change, cross section versus time series

| Change in unemployment rate | Age 22 to 54 | Age 25 to 54 |
|---|---|---|
| | Our estimate 1/ | Dernburg and Strand 2/ |
| Less than 3.5 to (3.5 to 4.9) | +.0022 | -.0003 |
| (3.5 to 4.9) to 5.0 and over | -.0099 | -.0004 |
| | Age 55 and over | |
| Less than 3.5 to (3.5 to 4.9) | -.0010 | -.0026 |
| (3.5 to 4.9) to 5.0 and over | -.0408 | -.0036 |

1/ Weighted average for all education levels.

2/ The response to 1 percent change in unemployment was calculated for each age sub-group and averaged using participation rate and population weights. The first change was counted as a 1.25 percent change and the second as a 1.75 percent change.

Continuous Labor Supply--Results

The continuous index of hours supplied during 1966 was estimated for two age groups: men, age 22 to 54 and those 55 and over. The supply was only estimated for those who worked one or more weeks in 1966. Anyone who reported that his main reason for not working the full year was enrollment in school or illness was excluded from the regression. Only 6 percent of those age 22 to 54 who worked in 1966 were excluded, as were 9.5 percent of those age 55 and over. The regression results are given in appendix tables F-3 and F-4.

As in the dichotomous case, married men with their wives present tend to supply more labor than single men. For the prime-age group, this effect is strongest for those with the lowest wages. The presence of children under 18 years of age has the same effect. In an unreported regression, the interactions between the presence of a wife and the income variable were found to be insignificant.

The hours supplied decline with age. The mean number of hours supplied in 1966 by men 22 to 54 was 2,305, compared with 2,039 for men 55 and over. The hours supplied drop off rapidly after age 62. Men over 73 who work at all are estimated to supply 1,010 fewer hours per year than men age 55 to 62.

Negroes and others had a significant tendency to supply fewer hours than whites. The reduction in hours is even greater for Negroes in the South. The same effect was observed for residents of poverty tracts. A tempting explanation for these results would be the existence of greater discouragement effects caused by poorer opportunities and racial discrimination. However, we found no such effect on labor force participation for these groups in March or in the unreported regression which explained participation at any time during the year. If there is no evidence of this for participation, it is hard to see why the effect would be so strong for hours supplied. One possibility is discrimination in allocating overtime. Since there is greater urgency in looking

for the first job, discrimination could have a discouragement effect only for the second job.

A more consistent explanation is the existence of demonstration effects as mentioned in chapter II. In an unreported regression, we found a very weak and insignificant effect for personal income in the SMSA, but it is possible that the SMSA is too large an area to reveal relative income effects.

A possible explanation for the race differential is that Negroes are in occupations or industries where less overtime is worked. This by itself would not cause a decrease in hours "supplied." However, since our index does not count as hours supplied the hours of overtime desired, the explanation is quite plausible. 19/

Education has a very large effect on labor supply for both age groups. Explanations for this were given in the previous section. The difference between the lowest group and those who completed college or went to graduate school is greater for men 55 and over than for those under 55. This pattern was also observed in March participation. The interaction between education and age over 73 was not significant for the hours equation.

The self-employed supply more hours. This may result from greater rewards in the form of personal satisfaction and unreported earnings for this group; but to reverse the causation, more diligent men may be self-employed.

Almost all of the wage and income terms and their interactions are statistically significant. To facilitate interpretation of these results, table 8 lists the number of hours worked and the total family income for all wage and income levels. The interactions between the

19/ In 1966, male professional and technical workers, managers, officials and proprietors worked an average of 46.6 hours. These two occupations made up 27.6 percent of all white male employment in 1966 and only 9.2 percent of all other male employment. On the other hand, male nonfarm laborers worked an average of 36.2 hours per week during 1966. Nonfarm laborer employment was 6.0 percent of all male white employment and 12.6 percent of all other employment. Data are from Employment and Earnings and Monthly Report on the Labor Force, January 1968 (U. S. Department of Labor, Bureau of Labor Statistics).

Table 8. Labor supply for married men by age, wage and other family income other factors constant

| Wage (dollars per hour) | Family income less own earnings (dollars per year—FILOW) | Age 22 to 54 1/ | | Age 55 to 72 2/ | | Age 73 and over 2/ | |
|---|---|---|---|---|---|---|---|
| | | Hours supplied | Total 3/ family income | Hours supplied | Total 3/ family income | Hours supplied | Total 3/ family income |
| 0 - [illegible].99..... | 0 - $499 | 2,849 | 1,674 | 2,650 | 1,575 | 2,009 | 1,254 |
| $1.00 - $2.49..... | 0 - $499 | 2,667 | 4,917 | 2,561 | 4,732 | 1,920 | 3,610 |
| $2.50 - $4.99..... | 0 - $499 | 2,292 | 8,844 | 2,328 | 8,980 | 1,687 | 6,576 |
| $5.00 +..... | 0 - $499 | 2,121 | 12,975 | 2,123 | 12,988 | 1,482 | 9,142 |
| 0 - $0.99..... | $500 - $1,499 | 2,661 | 2,330 | 2,539 | 2,269 | 1,529 | 1,764 |
| $1.00 - $2.49..... | $500 - $1,499 | 2,619 | 5,583 | 2,415 | 5,226 | 1,405 | 3,459 |
| $2.50 - $4.99..... | $500 - $1,499 | 2,267 | 9,501 | 2,195 | 9,231 | 1,185 | 5,444 |
| $5.00 +..... | $500 - $1,499 | 2,111 | 13,665 | 2,123 | 13,738 | 1,113 | 7,678 |
| 0 - $0.99..... | $1,500 - $3,499 | 2,726 | 3,863 | 2,411 | 3,705 | 1,461 | 3,230 |
| $1.00 - $2.49..... | $1,500 - $3,499 | 2,542 | 6,948 | 2,333 | 6,583 | 1,383 | 4,920 |
| $2.50 - $4.99..... | $1,500 - $3,499 | 2,246 | 10,922 | 2,084 | 10,315 | 1,134 | 6,752 |
| $5.00 +..... | $1,500 - $3,499 | 2,101 | 15,105 | 2,135 | 15,310 | 1,185 | 9,610 |
| 0 - $0.99..... | $3,500 and over | 2,616 | 5,808 | 2,424 | 5,712 | 1,471 | 5,235 |
| $1.00 - $2.49..... | $3,500 and over | 2,578 | 9,011 | 2,445 | 8,779 | 1,492 | 7,111 |
| $2.50 - $4.99..... | $3,500 and over | 2,232 | 12,869 | 2,162 | 12,607 | 1,209 | 9,034 |
| $5.00 and over..... | $3,500 and over | 2,125 | 17,249 | 2,106 | 17,136 | 1,153 | 11,418 |

1/ Hours supplied predictions from appendix table F-3 for married, spouse present, 12 years education, children, nonpoverty, nonSouth, white, not self-employed.

2/ Hours supplied predictions from appendix table F-4, for married, spouse present, 12 years education, nonpoverty, white, not self-employed.

3/ Calculated by applying mean wage to hours supplied computed from regression.

wage and the presence of a wife are included. The mean of each income and wage bracket was used to give the income level.

The results indicate a backward-bending supply curve of labor as wages increase. This confirms most previous evidence and implies that the income effect is negative and larger in absolute value than the substitution effect. The supply elasticities, averaged over other family income levels, are presented in table 9. The results are nearly the same for all age groups. For an hourly wage increase from below $1.00 to the $1.00 - $2.49 bracket, the elasticity is small. In an unreported regression in which more wage levels were used there was a tendency for a small increase in supply between wages below 75 cents and 75 cents to $1.49 an hour. It seems that the supply of labor becomes backward-bending at around $1.25 per hour.

The wage rate elasticities calculated at the higher wage levels are very similar to those found by other authors. For instance, Douglas concluded that the elasticity must be between -.1 and [illegible] Kosters found elasticities between -.06 and -.10 21/ for those age 50 to 64. However, since our results indicate that the supply function does not have a constant elasticity, these other results are misleading.

Income and Substitution Effects

Looking at the change in labor supply between levels of family income (less the male's earnings for each wage rate) shows that the hours supplied decrease with income. Changes in hours per dollar increase in income are shown in table 10.

20/ Douglas, op. cit., p. 312.
21/ Kosters, op. cit., p. 35.

Table 9. Wage elasticities of married men by age and wage - other factors constant

| Wage change | Elasticity 1/ $\frac{\Delta L}{L} / \frac{\Delta W}{W}$ | | |
|---|---|---|---|
| | Age 22-54 2/ | Age 55-72 3/ | Age 73 + 3/ |
| 0 - .99 to $1.00-$2.49..... | -.038 | -.024 | -.039 |
| $1.00-$2.49 to $2.50-$4.99... | -.194 | -.147 | -.237 |
| $2.50-$4.99 to $5.00 and over | -.143 | -.070 | -.121 |

1/ The supply was average over all income levels for each wage, and elasticities were calculated at the midpoints (arc elasticities).

2/ Prediction for married, spouse present and children from tables 7, F-3, and F-4.

3/ Predictions for married, spouse present and not self-employed from tables 7, F-3, and F-4.

Table 10. Predicted supply response to income changes for men by age and wage

| Change in total family income less own earnings dollars per year | Wage dollars per hour | Δ Supply 1/ Δ Income | | |
|---|---|---|---|---|
| | | Age 22 to 54 | Age 55 to 72 | Age 73 and over |
| 0-$499 to $500-$1,499.. | 0 - .99 | -.251 | -.148 | -.640 |
| $500 - $1,499 to $1,500 - $3,499..... | 0 - .99 | .043 | -.085 | -.045 |
| $1,500 - $3,499 to $3,500 and over..... | 0 - .99 | -.055 | .006 | .005 |
| 0 - $499 to $500 - $1,499..... | $1.00 - $2.49 | -.064 | -.195 | -.687 |
| $500 - $1,499 to $1,500 - $3,499..... | $1.00 - $2.49 | -.051 | -.055 | -.015 |
| $1,500 - $3,499 to $3,500 and over..... | $1.00 - $2.49 | .018 | .056 | .055 |
| 0 - $499 to $500 - $1,499..... | $2.50 - $4.99 | -.033 | -.177 | -.669 |
| $500 - $1,499 to $1,500 - $3,499..... | $2.50 - $4.99 | -.014 | -.074 | -.034 |
| $1,500 - $3,499 to $3,500 and over..... | $2.50 - $4.99 | -.007 | .039 | .038 |
| 0 - $499 to $500 - $1,499..... | $5.00 and over | -.013 | .000 | -.492 |
| $500 - $1,499 to $1,500 - $3,499..... | $5.00 and over | -.007 | .008 | .048 |
| $1,500 - $3,499 to $3,500 and over..... | $5.00 and over | .012 | -.015 | -.016 |

1/ Calculated between the mean incomes of the brackets.

The substitution effect is defined as

$$\left(\frac{\partial L_H}{\partial W_H}\right) - L_H \left(\frac{\partial L_H}{\partial Y}\right)$$

where $L_H$ is the husband's labor supply. For discrete changes, a unique measure of the effect cannot be derived because either the initial or terminal hours supplied or anything in between can be used. This is essentially the same problem as choosing between Laspeyres and Paasche price indices. However, the substitution effect must still have a positive sign regardless of which value of $L_H$ is chosen. 22/ We have calculated substitution effects using the mean of the initial and terminal values. The income effects were calculated from the change in supply for an increase in FILOW income to the next highest bracket keeping the wage at the initial level. Table 11 shows the results for married men.

Most of the substitution effects have the wrong sign. A negative substitution effect in our model suggests that the individual has minimized his utility subject to the constraint. Since the substitution term is the difference between two random variables, we would expect some of the estimates to have a negative sign, but there is clearly no tendency for positive substitution effects in these results. Kosters also found positive substitution effects. Several explanations for this will be considered.

The trouble is probably in the income effect estimates. An income effect of minus 100 hours for each $1,000 increase in FILOW below $10,000 total family income and minus 50 hours for each $1,000 increase in FILOW above $10,000 total family income, would be sufficient to give all of the substitution effects the correct sign. All evidence indicates that the income effect should be negative. This follows from the concept of leisure as a superior good. Becker explains this more elaborately in "A Theory of the Allocation of Time." In his analysis, consumption

22/ The sign would be negative if we were discussing the demand for leisure, instead of the supply of labor.

Table 11. Substitution effects for married men by age, wage, and income - other factors constant

| Wage change dollars per hour | Family income less own earnings dollars per year | Substitution effect $(\frac{\Delta \text{ supply}}{\Delta \text{ wage}})_u$ | | |
|---|---|---|---|---|
| | | Age 22-54 1/ | Age 55-72 2/ | Age 73 and over 2/ |
| 0 - .99 to $1.00 - $2.49..... | 0 - $499 | 545.7 | 314.4 | 1186.1 |
| $1.00 - $2.49 to $2.50 - $4.99..... | 0 - $499 | - 28.8 | 359.4 | 1121.9 |
| $2.50 - $4.99 to $5.00 and over..... | 0 - $499 | - 2.5 | 303.5 | 969.4 |
| 0 - .99 to $1.00 - $2.49..... | $500 - $1,499 | -148.0 | 112.2 | - 32.7 |
| $1.00 - $2.49 to $2.50 - $4.99..... | $500 - $1,499 | - 50.6 | 16.0 | - 91.0 |
| $2.50 - $4.99 to $5.00 and over..... | $500 - $1,499 | - 38.7 | 127.8 | 7.1 |
| 0 - .99 to $1.00 - $2.49..... | $1,500 - $3,499 | - 2.3 | - 77.8 | - 69.5 |
| $1.00 - $2.49 to $2.50 - $4.99. ..... | $1,500 - $3,499 | -191.1 | -248.2 | - 193.1 |
| $2.50 - $4.99 to $5.00 and over..... | $1,500 - $3,499 | - 49.2 | - 59.6 | - 20.8 |

1/ Predictions from regression for married, spouse present and children.

2/ Predictions from regression for married, spouse present and not self-employed.

requires leisure time. Therefore, an increase in leisure must accompany an income and consumption increase unless inferior goods are sufficiently time intensive. It turns out in Becker's model that the substitution effect for labor may be negative, but this is not a likely occurrence.

There is evidence (Miller) that underreporting of unearned income increases with income. However, this should bias the income effect away from zero and would not explain the positive income effects.

One possible reason for the wrong sign in the substitution effect is that the family really does not act as if it has one utility function. A regression was run for prime-age married men in which the wife's total income and the head's unearned income (income not related to the number of hours worked) were introduced as separate variables. The wife's income was held constant for the calculation of substitution terms, but only 37 of 75 substitution terms were positive. For those whose wife contributed less than $1,000 and probably was not working at all, 8 of 15 were positive. In a comparable regression with FILOW income, in place of the head's unearned income and wife's total income, 11 of 33 substitution terms were positive. The improvement is slight if the income of the wife is separated from FILOW.

One of the previous assumptions was that the cross substitution effect between the family members' leisure equals zero. What will be the direction of bias if this is not true? If the leisure of the family members is complementary, an increase in the wife's wage will cause the husband to work more than he would if there was only an income effect. Estimates of the income effect would then be biased in a positive direction. However, as mentioned in the last paragraph, there was no great change in the results when the wife's total income was separated from the husband's own unearned income and the husband's unearned income was used to determine the income effect. Only 51 to 90 income effects were negative in this case.

The theoretical conclusions concerning the substitution and income effects hold for a rational individual whose preferences are constant. Our estimates are based on observations on different individuals at one point in time. It is not clear that the two are equivalent. This problem has been discussed extensively in the consumption literature. The permanent income hypothesis which was advanced to explain differences between cross section and time series consumption functions may be applicable to our present problem. If unearned income and the wife's income is viewed as transitory and the husband's earned income is viewed as permanent, the supply reduction for increases in FILOW will be less than the reduction for increases in the wage rate. This would explain the erratic income effect and the resulting positive substitution effects.

In the next chapter, a skill index is used to represent the woman's wage. This skill index is possibly related to the supply of hours. The reason for this is the correlation between education and occupation. As we have found, education is positively related to labor supply. Because there is a positive relationship between wage and education, wage and education interactions were specified in an equation for adult men. The results were largely the same as in the regressions reported here. We conclude that there is no misspecification when these interactions are not included.

For the reasons discussed above, we believe that the income effect is underestimated. However, one reason for possible over-estimation of the wage response lies in the construction of the wage variable. This variable was estimated by dividing earnings in 1966 by an estimate of hours worked in 1966. For those whose hours worked in 1966 equal their hours supplied, errors in the wage variable will impart a negative correlation between hours supplied and the wage rate. Because of our use of step functions, it does not seem likely that this bias is very large.

Taxes

Income taxes have been neglected in our analysis. If disposable income appears in the utility function, it could cause a bias in the results. Consider the effect of an increase in total income. If it moves the individual into a higher tax bracket, the net effect on supply will not be a simple income effect. The same is true for a wage increase. As an example, consider a person who receives a wage W and unearned income Y. In figure 2, disposable income is measured along the horizontal axis and leisure along the vertical axis. Two tax rates are assumed with no exclusions. All income is taxed at a rate of $r_o$ until gross income equals $I_1$. It is then taxed at a higher rate, $r_1$. The income-leisure constraint for this person is TABC, where T is the total number of hours in the supply period. The slope of the segment AB is $-1/[(1-r_o)W]$ and the slope of the segment BC is $-1/[(1-r_1)W]$. At the initial wage the individual maximizes his utility and works T-H hours. If the wage increases to W', the constraint shifts out to TAB'C'. It is assumed that he receives no extra benefits from government services. He is now in a higher tax bracket and is working T-H' hours per period. The effective segment of the constraint has shifted from AB to B'C'. The person responds as if his wage had increased by $W'(1-r_1) - W(1-r_o)$ and his unearned income by $(1-r_1)Y + (r_1-r_o)I_1 - (1-r_o)Y = (r_1-r_o)(I_1-Y) =$ AA'. Therefore, the wage increase has an additional income effect. Similarly, if there is an increase in income, the net wage is reduced when the person enters a new bracket.

Since the supply function was estimated as a step function with interactions between the wage and income variables, the extent of the bias can be calculated if assumed it is that everyone in a given wage and income category with the same marital status faces the same marginal tax rate. This is of course not true even for adjusted gross income categories, 23/ and adjusted gross income varies for those with the

23/ U. S. Internal Revenue Service, Statistics of Income, 1966: Individual Income Tax Returns.

same unadjusted gross income. Tax rates also vary between States and cities, but we only consider the effects of the Federal income tax.

From the total effects of wage and other family income changes and 1966 income tax rate schedules, we can solve for the substitution effect for a change in net wages and the income effect for a change in net income. Writing the supply equation in discrete terms and dividing by changes in gross wages and gross FILOW income gives:

W = wage

F = FILOW income

L = labor supply

Subscript n = net of taxes

Subscript g = gross

$$\frac{\Delta L}{\Delta W_g} = \left[\left(\frac{\Delta L}{\Delta W_n}\right)_{\bar{u}} + L\left(\frac{\Delta L}{\Delta F_n}\right)\right]\left(\frac{\Delta W_n}{\Delta W_g}\right) + \left(\frac{\Delta L}{\Delta F_n}\right)\left(\frac{\Delta F_n}{\Delta W_g}\right)$$

$$\frac{\Delta L}{\Delta F_g} = \left[\left(\frac{\Delta L}{\Delta W_n}\right)_{\bar{u}} + L\left(\frac{\Delta L}{\Delta F_n}\right)\right]\left(\frac{\Delta W_n}{\Delta F_g}\right) + \left(\frac{\Delta L}{\Delta F_n}\right)\left(\frac{\Delta F_n}{\Delta F_g}\right)$$

The two equations can be solved easily for the two unknowns,

$$\left(\frac{\Delta L}{\Delta W_n}\right)_{\bar{u}} \text{ and } \frac{\Delta L}{\Delta F_n}.$$

The net and gross effects cannot be directly compared since they have different dimensions, but we are interested in possible differences in signs between the calculated net effects and the observed gross effects. As an example, the net effects were calculated from the solution to the two equations for a married man with two children, $1,000 FILOW income, and $1.75 wage. His gross income is estimated to be $5,583. (See table 8.) The marginal tax rate in 1966 for this gross income would be 16 percent with a standard deduction. The net income effect for an increase that would put him in the 19 percent bracket is [(1.203) x (Observed income effect) - .009]. The sign changes only if the observed effect is .009/1.203 or less. The observed income effect is left out of the calculations because it is the most suspect term. The size of the

adjustment increase with the observed supply response to wage changes, but the adjustment remains small.

The sign of the substitution effect after adjustment for taxes depends upon the relative biases of the wage response and the income response when they have the opposite sign. For the family mentioned above, the substitution term for a wage increase from $1.75 to $3.75 per hour is [-(3001) x (Observed income effect) - 203]. The comparable unadjusted effect is [-(2443) x (Observed income effect) - 176]. The income effect must be -.068 or less in the adjusted case or -.072 or less in the unadjusted case for the substitution effect to have the correct sign. The effect of neglecting taxes is to increase the minimum absolute size of the income effect that will give the correct sign for the substitution effect.

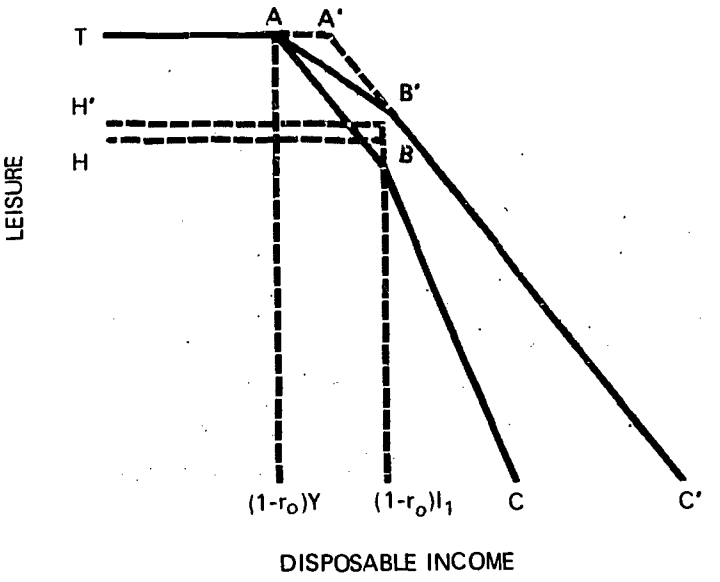
The wage rate which was estimated is an average not a marginal measure. For those who work overtime at a higher wage, the marginal wage rate is greater than the average wage rate. This difference affects the relative sizes of the income and substitution effects in the same way that taxes do (figure 2). A wage change has an added income effect when overtime is taken into account, but estimates of the income effect are unchanged. Allowance for overtime premiums makes some of our negative and near zero substitution effects positive.

In summary, the bias introduced into the substitution term by ignoring taxes and overtime premiums is small, but both bias the substitution term in a negative direction.

A Negative Income Tax

There has been much discussion about income maintenance programs such as a negative income tax for alleviating poverty. One of the important questions raised is the effect of such a transfer plan on work incentives. This problem is currently being examined by one of the authors in a study that utilizes this same cross sectional data. At this

Figure 2.



point only a rough estimate of these supply effects can be offered, and we must assume that people respond to negative income tax provisions in the same way that they do to wage and income changes.

To calculate these effects we refer to an unreported regression in which narrower wage and income intervals were used. The results are generally the same as in appendix table F-3. Consider a married man with a low level of education who earns $1.15 per hour and has no unearned income. He will supply, according to estimates, 2,519 hours per year and earn $2,897. As an example, a hypothetical negative income tax plan is used that sets a poverty line of $3,000 and offers benefits equal to 50 percent of the difference between $3,000 and the family's income. These provisions should affect the man in the same way as an increase in unearned income of $1,500 and a 50 percent wage reduction. The reasons for this can be seen by referring back to figure 2 and the discussion of taxes. The estimated number of hours supplied under this plan is 2,204 and family income is $2,767. There is a supply reduction of 15 percent. The reader can calculate the effects of other transfer plans using the data in tables 9 and 10.

The supply response just calculated is of course only for the person who is below the poverty line but who is working. There also may be reductions in hours supplied for those above the poverty line, but we need a more accurate estimate of the substitution effect to determine the extent of this. A man earning $1.50 per hour is estimated to supply 2,388 hours and earn $3,582. It would take a substitution effect of at least +291 change in hours supplied per dollar wage change for him to take advantage of the negative income tax by supplying fewer hours. Our evidence does not seem to indicate that the substitution effect is this high. Positive incentive effects are expected for persons already receiving welfare because of the less than 100 percent marginal tax rate under a negative income tax.

Summary

In this chapter we developed and tested a model to explain the labor force participation and supply of hours for adult men. We first derived a supply function for a family utility model. The wage rate and total family income minus the male's earnings (FILOW) produced estimates of the substitution and income effects.

Regressions which explain March 1967, participation for adult men living in SMSA's, were presented. Adult men have a very high degree of participation, 96.3 percent for those in the sample ages 22 to 54. This participation falls continually after age 55. We found strong positive effects of education and marriage. Residence in a poverty tract, unemployment in the SMSA and FILOW income have negative effects. Area employment change had a significant positive coefficient only for older men, and residence in the South was not significant. Whites had the same probability of participation as Negroes and others combined, ceteris paribus. The response to area unemployment conditions was greatest for those with the least education and those over 55. The reduction in the probability of participation for increased FILOW income was greatest for single men and older men.

A continuous index of hours supplied in 1966 was estimated for 1966. Age, education, marriage, and residence in a poverty tract had the same effects as in the case of March 1967 participation. In addition, the self-employed and those with dependent children were found to supply more hours. Whites supplied more hours than Negroes and others combined. The reasons advanced for this are differences in relative income and occupational differences. The supply of hours is reduced as the wage increases, which confirms previous estimates. The supply elasticity with respect to wages for men 22 to 54 is about -.038 for wages under $2.50 per hour, -.194 for wages between $2.50 and $5.00 per hour, and -.143 for wages over $5.00 per hour. The income effect was estimated to be generally negative. Positive income effects are inconsistent with

the negative supply response for wage increases because economic theory tells us that the substitution effect should be positive for the supply of labor. Many of our substitution effects are negative, and several explanations for this are considered. The biases introduced by neglecting the Federal Income Tax are measured and found to be small.

It was found that adult men have a strong attachment to the labor force and supply a large number of hours each year. Nevertheless, differences in wages, income, and area employment opportunities can have important effects on the individual man. The supply responses which we observe probably tend to be longrun responses, but the exact pattern of dynamic supply changes needs to be determined. To this end, a pooling of cross sections taken at different points in time is the logical next step.

## Chapter IV. Labor Supply of Adult Women

The increase in the labor force participation of adult women of all age groups in the past 20 years has far exceeded projections, (Bancroft; McNally) especially among women age 45 to 64 whose participation has increased from 29.1 percent in 1947 to 47.7 percent in 1967. 24/

The increases have even been more dramatic among married women whose participation jumped from 22.0 percent in 1948 to 36.8 percent in 1967. 25/

A number of studies of labor force participation of women carried out within the past few years have addressed themselves in part to the reasons for the increase in labor force participation of adult women. 26/ These increases have puzzled observers for several reasons. First, large increases have come among married women who in the past were much less likely to participate than single women. Today, married women are still less likely to participate, but as table 12 indicates, the differential is narrowing. Even more puzzling, was the fact that the rapid increase in participation of married women occurred at the same time male wage and salary income increased rapidly. As the model developed in chapters II and III suggests, participation of married women should fall as their husbands' income increases, ceteris paribus.

Jacob Mincer (1962) offered an explanation for the secular increase in labor force participation of married women. As income and wages rise, women must not only decide between market work and leisure, but must allocate their time between market work, leisure, and homework. As market wages rise relative to the cost of child care, meal preparation, and other homework, women will participate more. The empirical findings reported in this chapter provide some estimates of the importance of the income and substitution effects for women.

24/ Handbook of Labor Statistics, 1968 (BLS Bulletin 1600), pp. 27-33.
25/ McNally, op. cit., p. 206.
26/ For a review of the overall literature of labor force supply, see chapter I. For studies dealing primarily with adult women, see the following authors: Altman, Cain, Katz, Korbel (1963), Mahoney, Mincer (1962), and Rossett. See also, "A Symposium: Women in the Labor Force," Industrial Relations (May 1968). In addition, see the various BLS Special Labor Force Reports that deal with women in the labor force and marital and family status of workers.

Table 12. Civilian labor force participation rates of women by age and marital status, 1957 and 1967

| Marital status | Age | | | |
|---|---|---|---|---|
| | 25 to 34 | 35 to 44 | 45 to 64 | 65 and over |
| | 1957 | | | |
| Married, spouse present... | 27.6 | 36.5 | 32.4 | 6.6 |
| Other, ever married..... | 63.9 | 72.6 | 58.8 | 11.2 |
| Single, never married..... | 84.4 | 82.9 | 76.4 | 23.7 |
| | 1967 | | | |
| Married, spouse present... | 35.5 | 42.7 | 41.3 | 6.9 |
| Other, ever married..... | 64.3 | 71.7 | 61.8 | 10.1 |
| Single, never married..... | 82.2 | 80.0 | 74.2 | 19.4 |

Another issue which has received a great deal of attention in studies of labor supply of adult women is the question of which is stronger, the additional worker or the discouraged worker effect. According to the additional worker effect, married women (or other secondary workers) will enter the labor market to maintain desired family income if family income drops. The additional worker hypothesis pertains to shortrun or transitory income behavior, while the regular income effect pertains to the longrun income response.

According to the discouraged worker hypothesis, when employment conditions worsen in the woman's labor market, she is more likely to drop out of the labor force since her probability of finding a job decreases. 27/

According to table 12, the participation rate of middle-aged single women during March 1967 was about twice that of middle-aged married women living with their husbands. The differential is even greater for women 25 to 34 and 65 and over. The participation rate in the "other" marital status group lies somewhere in between the other two groups. Thus, it was necessary to take account of marital status and age in the regressions.

The next section presents the regression results. Independent variables included in our model are discussed in the following sections: Income variables, educational attainment, skill index, area variables, and family and demographic variables.

## The Results

Three measures of labor supply were used as dependent variables, as discussed in chapter II: In or out of the labor force during March 1967; in or out of the labor force during 1966; and number of hours supplied. Regressions were run for adult women living in the 96 largest SMSA's and for all adult women. Some regressions were run only for adult women

27/ See Mincer (1962); Mincer (1966); and Cain (1966).

living with their husbands, while other regressions included single women, divorced, separated and widowed women, as well as married women with spouse present.

The major regressions discussed in this chapter are presented in full in appendix tables F-5 through F-10.

In the sample used, there were 25,143 women 22 and over living in the largest 96 SMSA's. Their labor force participation rate was 40.5 percent. For the same period, the average participation rate for women 22 and over living in all areas was 40.2 percent. The estimates presented in the remainder of this chapter are unweighted. and they differ slightly from the weighted estimate. The weighted estimate of the participation rate for women 22 and over living in all areas was 39.9 percent. 28/

As in the regressions in chapter III, the coefficients represent deviations from an arbitrary level of each factor.

As in chapter III, since the dependent variable was dichotomous and an ordinary least squares estimating procedure was used, the actual t values are greater on the average than those obtained. A discussion of the use of generalized least squares to make more precise estimates of the standard errors is contained in appendix E.

The mean of the dependent variable was .478, compared with .405 (40.5 percent) for participation during March 1967.

Contrary to expectations, less of the variation in participation was explained at any time during 1966 than participation during March 1967. We thought that participation of women at any time during a year would be less influenced by random influences than participation during a given month. The differences between the two $R^2$'s were not great, however.

28/ The weighted estimate would be comparable to data published in Special Labor Force Reports. These data are not composited as are monthly CPS data. For a technical description of the compositing process, see U. S. Bureau of the Census, The Current Population Survey: A Report on Methodology, Technical Paper No. 7. The comparable composited estimate was 39.8 percent.

The main differences between the coefficients in the regressions involving the two measures of participation, after taking account of the difference between the overall means, are due to marital status and age. These differences are summarized in table 13. For each age group and marital status class of adult women shown in the two tables, participation was greater at some time during 1966 than during March 1967. However, the differences between similar marital status age groups ranged from 3.5 percentage points for never-married women age 22 to 54, to about 10 percentage points for women married, spouse present, under age 65. The difference in the two participation rates is greater for married women living with their husbands than the other two groups, even though married women living with their husbands have the lowest participation rates in each of the two tables.

Older women were more likely to work at any time during 1966 than in March 1967, because some of them retired from the labor force then. In addition, older women may also only want jobs part of the year.

A continuous index of the number of hours supplied in 1966 was used in a few regressions for adult women, married, spouse present. Only women who lived in the largest 96 SMSA's and who worked one or more weeks during 1966 were included in the regression. The index is described in more detail in chapter II and appendix A.

The following differences between the index of hours supplied and participation rate stand out for varying age groups:

1. Women age 35 to 54 are less likely to participate in the labor force than women 22 to 34. However, if they do participate they are expected to supply 60 more hours per year than 22 to 34 year olds.

2. While women age 55 to 64 have a predicted participation rate 21.4 percentage points below women age 22 to 34, the difference in the hours both groups wish to supply per year is insignificant. 29/

29/ See appendix tables F-7 and F-8 for the regressions.

Table 13. Labor force participation of women by marital status and age, all other factors in regression held constant (in percent) 1/

| Participation at any time during 1966 2/ | | | |
|---|---|---|---|
| Age | Marital status | | |
| | Married, spouse present | Married, other | Never married |
| 22 to 54 years..... | 55.6 | 70.9 | 84.8 |
| 55 to 64 years..... | 50.0 | 60.9 | 67.8 |
| 65 and over years..... | 15.2 | 16.5 | 23.9 |

| Participation during March 1967 3/ | | | |
|---|---|---|---|
| Age | Marital status | | |
| | Married, spouse present | Married, other | Never married |
| 22 to 34 years..... | 45.4 | 65.4 | 81.3 |
| 55 to 64 years..... | 40.8 | 52.8 | 62.8 |
| 65 and over years..... | 10.0 | 10.1 | 16.1 |

1/ Women with 12 to 15 years of education with FILOW between $1,500 and $7,499, living in SMSA's with an unemployment rate between 3.5 and 4.0 percent, and a rate of employment change between 3.5 and 6.49 percent and relative employment opportunities between 62.0 and 73.9 percent.

2/ Based on table F-6.

3/ Based on table F-5.

A fuller discussion of differences is found in the remaining sections of the chapter which is organized by variable rather than by regression.

Income Variables

Two income variables are included in the regressions discussed in this chapter: FILOW and the husband's employment status during March 1967. They measure respectively longrun and shortrun income effects. 30/

The theoretical justification of including the FILOW variable is presented in chapters II and IV. The husband's employment status variable is useful for measuring the importance of the additional worker hypothesis, that is, when the husband becomes unemployed the wife will be more likely to enter the labor force to bring family income up near its old level. 31/

In addition to some of the general limitations discussed in chapter I, the income variable reported in this chapter has other limitations.

1. Unearned income is generally underreported, as the discussion in chapter III indicated. Even earned income is not always accurately remembered by the survey respondent.

2. Labor supply is likely to depend on the type of income, as well as the amount. A wife whose husband received an $8,000 salary and an unexpected $2,000 bonus in 1966, is likely to supply a different amount of labor in March 1967, than a wife whose husband receives a $10,000 salary without bonus in 1966. A woman age 62 to 72, who receives social security income subject to her earning less than $1,500 in 1966, is less likely to work than a woman who receives a pension with no restrictions. Unfortunately, the information in the CPS on sources of income is too aggregate to permit distinctions of this nature to be made.

3. Since labor force participation is being explained for March 1967, it would be desirable to include a measure of income such as FILOW for

30/ FILOW is the abbreviation for Family Wages Less Own Wages and Income.
31/ For a discussion of some alternative measures of short-run income response, see Katz, op. cit.

first quarter 1967, or for February or March 1967, as well as 1966. However, this information was not included in the survey. Inclusion of this information in future Current Population Surveys is being seriously considered by the Department of Labor and the Census Bureau.

4. Shortrun or transitory income was estimated by including the variable employment status of the husband during March 1967, in the regression. This variable was not included together with FILOW for 1966 in this paper. 32/

5. Separate estimates of supply elasticities by age and race were not made. We assumed whites and others had the same elasticities. 33/

Despite these limitations, the regressions presented in this chapter do provide an overall estimate of the effect of shortrun and longrun income on participation. Comparisons of the results of the regressions are summarized below.

Table 14 shows that FILOW is highly significant and of the predicted sign. As FILOW increases, participation is expected to drop. There are three sharp breaks in the labor force participation coming at FILOW's of $1,500 and $7,500 for 1966. Women with unearned income of $1,500 to $7,500 had a labor force participation rate 15.1 percentage points below women with FILOW below $1,500. Women with unearned over $7,500 had a labor force participation 23.6 percentage points below women with FILOW below $1,500. In another regression (not shown here), categories were added to test whether in fact there were sharp breaks between $1,500 and $7,500. We could not accept the hypothesis at even the .10 level that the coefficient of FILOW $1,500 to $3,000 differed from the coefficient of FILOW $5,000 to $7,500. However, when estimates were made of the elasticity of FILOW for subgroups of adult women, no evidence of non-linearity appeared.

32/ This was done in Malcolm Cohen, Robert Lerman and Samuel Rea, "The Effects of Family Income and Area Employment Conditions on Labor Force Participation--AMicro Study," paper presented at the meeting of the Winter meetings of Econometric Society, New York, December 1969.
33/ This assumption was relaxed in Cohen, Lerman, Rea, Ibid.

Table 14. Effect of FILOW
[Women 22 and over living in largest 96 SMSA's]

| FILOW | In or cut of labor force during March 1967 | | | | Hours supplied during 1966 | |
|---|---|---|---|---|---|---|
| | All adult women 1/ | | Married, spouse present 2/ | | Married, spouse present 3/ | |
| | B coefficient | T value | B coefficient | T value | B coefficient | T value |
| Less than $1,500..... | --- | --- | --- | --- | --- | --- |
| $1,500 to 7,499..... | -.1513 | -16.4 | -.0777 | -3.4 | -104.8 | -2.3 |
| $7,500 or over..... | -.2364 | -24.0 | -.1678 | -8.2 | -201.1 | -4.4 |

1/ Based on table F-5.

2/ Based on table F-7.

3/ Based on table F-8.

The FILOW coefficients for both married women, spouse present and for all married women combined are negative and significant statistically, but the magnitude of the coefficients for married women living with their husbands are about .07 less than for all women combined. Since married women living with their husbands constitute two-thirds of all adult women, the difference between married and single women is even greater. The apparent interpretation of these differences stems in part from the fact that, for married women, FILOW consists largely of husband's income, while for women not living with their husbands, FILOW consists largely of their own unearned income. This reflects the difference between married women with high FILOW and low participation, and single women with low FILOW and high participation.

The effect of FILOW on hours supplied by married women, living with their husbands can also be seen from table 14. Married women who have FILOW between $1,500 and $7,500 supply about 100 fewer hours per year than women with FILOW below $1,500; women with FILOW above $7,500 supply 200 fewer hours than women with FILOW below $1,500. These estimates are made for women who worked at least one or more weeks during 1966. Thus, the picture that emerges is that women with high FILOW are less likely to participate, and if they do participate they supply fewer hours. This picture is consistent with economic theory.

Another interesting comparison is between the longrun measure of income, FILOW, and the shorter-run measure, labor force status of the woman's husband during March 1967. In appendix table F-10, the measure was used to predict the woman's labor force participation during March 1967. 34/

The shortrun income variable, labor force status of the husband, was significant and consistent with a priori theory. Married women who had husbands employed during March 1967, had a labor force participation rate 8 percentage points below women with unemployed

34/ Appendix table F-10 differs from table F-7 in another way. Table F-10 includes women living in all areas and hence excludes SMSA variables.

husbands. 35/ There was no statistically significant difference in predicted labor force participation rate between women whose husbands were unemployed and women whose husbands were not in the labor force (for women age 22 to 34).

The difference of 8 percentage points in the participation of wives of employed versus unemployed husbands, ceteris paribus, is consistent with the additional worker hypothesis discussed earlier.

In another specification, the interaction between labor force status of the husband and age of the wife was omitted. This led to a significant negative coefficient for women whose husbands were not in the labor force. The coefficient had even a larger negative number than the coefficient of the employed category. Economic theory would suggest that women whose husbands were unemployed would have a higher participation than women whose husbands were employed due to the additional worker effect discussed earlier. One might argue that a wife is as likely to come into the labor force when the husband is not in the labor force as when he is unemployed. However, there are several important differences between unemployment of the husband and his nonparticipation. These can cause different labor force responses on the part of wives. First, nonparticipation is likely to become more permanent than unemployment. The additional worker effect is a shortrun response. Second, if the husband is retired and has adequate assets so that he is not looking for work, the wife would not be as likely to be in the labor force. Third, if the husband is unable to work the wife may be required to stay home to care for the husband. These factors are likely to interact with age and hence the interaction between age and husband not in the labor force was included. (See table 15.)

35/ White wives 22-54 with unemployed husbands had a labor force participation not significantly different from white wives with employed husbands, when both FILOW in 1966 and the husband's employment status in 1967 are included in the regression, according to Cohen, Lerman, and Rea.

Table 15. Effect of husbands' employment status
[Women 22 and over, married, spouse present] 1/

| Husbands' employment status | Age of woman | B coefficient | T value |
|---|---|---|---|
| Unemployed..... | | --- | --- |
| Employed..... | | -.0802 | -4.1 |
| Not in labor force..... | 22 to 34 | .0301 | 0.8 |
| Not in labor force..... | 35 to 54 | -.1079 | -3.6 2/ |
| Not in labor force..... | 55 to 64 | -.1779 | -5.5 2/ |
| Not in labor force..... | 65 and over | -.2006 | -5.8 2/ |

1/ Based on table V-10, dependent variable, in or out of the labor force during March 1967.

2/ Based on value pertaining to interaction term only.

Years of Schooling Completed

In most regressions, the variable, years in schooling completed by woman was included. This variable plays several roles in these regressions. It represents differences in tastes that women have for paid employment. The more years of school completed, the greater the woman's inclination toward paid work. The desire to work is also related to other factors. Women with college educations have a wider range of jobs open to them and at a higher wage than women without college degrees. In one regression a skill index was used as a proxy for the wage rate. In this regression the schooling variable was omitted. The discussion of this index however is postponed to the next section.

In making a decision whether or not to supply labor or how many hours to supply, a woman must also take into account the price of homework, as Jacob Mincer (1962) has pointed out. Thus, even if differences in tastes for paid work were independent of years of school completed, the regression should take account of differences in the price of homework. This is done in the regressions for married women, spouse present, by use of the variable age of youngest child. This variable is discussed in the section on family variables.

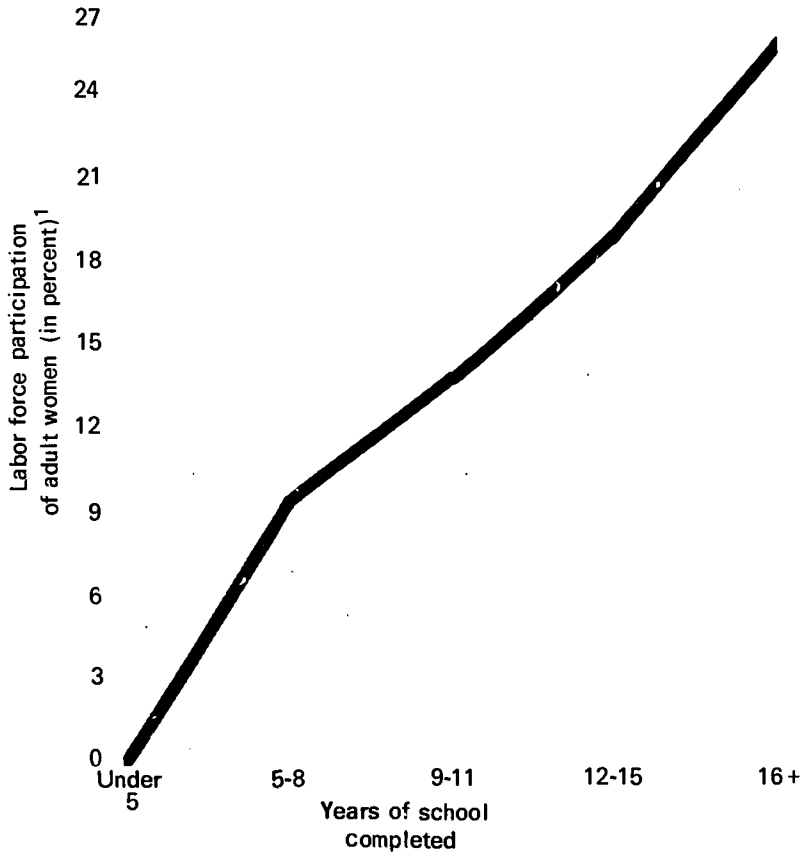
Educational attainment is positively associated with labor force participation of adult women. Chart 2 illustrates the relationship between years of schooling and labor force participation, ceteris paribus, based on table 15.

Included in the regressions were interactions between age 65 and over and years of schooling. At age 65, the effect of high school graduation is much less important than at earlier ages for all women, including women married, spouse present. (See table 16.)

A line drawn through the points in chart 2 nearly goes through them all, except for 5 to 8 years of education. Completing each level of education increases participation by about 6.5 percentage points.

Chart 2.

## The Ceteris Paribus effect of educational attainment on labor force participation of all adult women, March 1967




[1]The chart shows the effect on adult women of completing specified years of schooling. Differences are measured from the base level, "under 5 years," which is arbitrarily taken to be zero.

Table 16. Effect of educational attainment, marital status and age on participation during March 1967 1/
[Women living in the largest SMSA's]

| Years of schooling completed | Married, spouse present | | |
|---|---|---|---|
| | Age | | |
| | 22 to 54 | 55 to 64 | 65 and over |
| Under 5..... | 26.7 | 22.0 | 4.1 |
| 5 to 8..... | 35.9 | 31.2 | 4.6 |
| 9 to 11..... | 40.3 | 35.6 | 9.5 |
| 12 to 15..... | 45.4 | 40.8 | 10.0 |
| 16 and over..... | 53.2 | 48.5 | 16.7 |
| | Married, other | | |
| Under 5..... | 46.7 | 34.1 | 4.2 |
| 5 to 8..... | 55.9 | 43.3 | 4.7 |
| 9 to 11..... | 60.3 | 47.7 | 9.6 |
| 12 to 15..... | 65.4 | 52.8 | 10.1 |
| 16 and over..... | 73.1 | 60.5 | 15.8 |
| | Never married | | |
| Under 5..... | 62.6 | 44.1 | 10.1 |
| 5 to 8..... | 71.8 | 53.3 | 10.6 |
| 9 to 11..... | 76.2 | 57.7 | 15.5 |
| 12 to 15..... | 81.3 | 62.8 | 16.1 |
| 16 and over..... | 89.1 | 70.5 | 21.8 |

1/ Based on table F-5 for women with FILOW between $1,500 and $7,500 living in SMSA's with an unemployment rate 3.5 to 4.0 percent, employment change 3.5 to 6.49 percent, and relative opportunities 62.0 to 73.9 percent.

Years of school completed is positively related to tastes for paid employment; thus, using years of schooling as a proxy for the wage would only provide us with an estimate of the maximum elasticity of labor force participation with respect to the wage rate.

An estimate of median total money income for women 25 and over in 1966 by years of school completed divided by a standard number of hours for all years of schooling classes was used to obtain a wage rate. 36/ Making generous use of interpolation to make up for data not in the published table, a 10-percent increase in the wage rate would lead to a 1.3-point increase in labor force participation of adult women. At the mean labor force participation with respect to wages would be about 3.

From table 16 we can contrast the effect of education on participation of married women, spouse present to other women. Completion of college increases participation by substantially more for the married women living with their husbands than other women. Married women with a college education might be induced to work if the wage rate they received was sufficiently above that of noncollege graduates and if the net income was enough to cover home-care or husband-care-costs. Of course, the woman's tastes also play a role in the decision process, and married women with a college education might be more likely to enter the labor market than high school graduates even if they could not receive a higher wage.

The final comparison involving years of school completed is between participation and hours supplied. Both regressions are for married women living with their husbands. Table 17 compares these two regressions except for women with a college education. The jump in number of hours supplied from noncollege graduate to college graduate is small in comparison with the increase in March participation.

36/ U. S. Bureau of Census, Consumer Income, Income in 1966 of Families and Persons in the United States, p. 60, No. 53, December 28, 1967, p. 39.

Table 17. Effect of Education
[Women 22 and over, married spouse present]

| Years of school completed | In labor force, March 1967 1/ | | Hours supplied 2/ | |
|---|---|---|---|---|
| | B coefficient | T value | B coefficient | T value |
| Under 5..... | --- | --- | --- | --- |
| 5 to 8..... | .0321 | 1.1 | 36.5 | 0.5 |
| 9 to 11..... | .0826 | 2.9 | 86.1 | 1.1 |
| 12 to 15..... | .1381 | 5.0 | 135.4 | 1.8 |
| 16 and over..... | .3304 | 9.8 | 185.0 | 2.2 |

1/ Based on appendix table F-7.

2/ Based on appendix table F-8.

Skill Index

To obtain a more direct measure of the substitution effect of economic theory as we have done for adult men, it would be desirable to include a potential wage rate in the regression.

Women are more likely than adult men to work parttime or partyear. Unfortunately, only wide intervals are available for reported weeks worked and hours worked at the lower end. Since large errors in the calculated wage rate would be negatively correlated with the dependent variable, we based the estimate of the woman's market wage on her occupation of longest attachment. This is admittedly crude because of the class orientation of the occupational categories (Jencks and Reisman) and the wide range of wage rates within each of the occupations.

Occupations of longest job were coded into five categories based on median earnings of women working fulltime and fullyear in these occupations. The lowest paid occupational group included only private household workers. The highest paid group included professional, technical, and kindred workers. Appendix B contains the list of occupations included in each category. The skill index was omitted from most of the regressions for two reasons: First, it could only be constructed for women who worked one week or more during 1966. If the regressions were limited to these women, we would lose a great deal of generality in our results. Adult women who worked one or more weeks during 1966 had a much greater probability of participating during March 1967, than the average for all adult women. For example, the participation rate of all adult women married, spouse present, was 37.3 percent during March 1967. The rate for adult women married, spouse present, who worked during 1966, was 73.8 percent.

Second, the skill index is likely to be highly correlated with years of schooling. While differences in educational attainment are likely to reflect differences in the opportunity cost of not working, they also reflect differences in motivation, ability and tastes which are not

easily separable. A possible separation of these factors might be possible with either a better model or better data. For example, a model which included a theory of occupational choice might resolve this problem. Data on hourly or weekly wage rates that women earned over the last several years would also be useful. In any event, the separation of these factors for adult women is not nearly as possible as for adult men, most of whom worked a full year.

In one regression an index of the occupation of women working during 1966 was included as an indicator of the wage that a woman could obtain.

A serious attempt to compute the elasticity of labor supply with respect to wage change was only attempted with our continuous dependent variable. Here, all women are included who worked during 1966, with hours supplied during 1966 as the dependent variable. Using the wages assignable to each skill level given below and the coefficients from the regression, we computed a few elasticities. 37/

A wage was computed for fulltime, fullyear women workers in each skill group 38/ The median earnings of each group was divided by 2,000 hours to obtain the wage rate.

The average wage for each of the five skills was:

| | |
|---|---|
| Low | $ .67 |
| Medium-low | 1.20 |
| Medium | 1.57 |
| Medium-high | 2.17 |
| High | 2.79 |

According to the regression, the estimated coefficient for highly skilled women was below the estimate for medium-skilled women. However, the two coefficients differed by only one standard error and, therefore, the difference was not statistically significant.

To compute the elasticity of labor supply, we assumed low-skilled women supplied 1,000 hours. An elasticity of labor supply can be computed between each interval. The elasticities are:

37/ For the regression see appendix table F-9.
38/ U. S. Bureau of Census, Consumer Income: Income in 1966 of Families and Persons in the United States, p. 60 (No. 53, 1967), tables 25 and 23.

| | |
|---|---|
| Low - medium low | .30 |
| Medium-low - medium | .45 |
| Medium - medium-high | .25 |
| Medium-high - high | -.1 |

An elasticity of supply of 0.3 means that a 1-percent increase in wages will bring about a 0.3-percent increase in the expected number of hours supplied.

It is difficult to determine if the irregularity of the elasticity is real or is imposed by the arbitrary classes chosen to represent wages. However, there seems to be a reduction in elasticity as wages increase beyond a certain point, just as for adult men. The supply curve for women might be backward-bending at lower wages when we allow for taste effects, but a less crude proxy for wages is needed in order to cast light on this subject.

Care must be exercised in interpreting the computed elasticity because differences in wages reflect differences in the quality of labor or motivation. These differences may not be fully reflected in our model. If the taste for paid employment is positively related to years of schooling completed and differences in skill reflect differences in educational attainment, our estimates of the elasticity of labor supply with respect to wages will be biased upward.

From the model derived in chapter III, we note that the substitution effect is negative, as theory predicts, since both the wage rate and income effect variables are of the right sign.

Area Variables

All of the area variables tested were statistically significant, except the personal income per capita of the SMSA. This indicates that either the supply may not depend upon relative income in the community, or if a demonstration effect exists, it might be dependent on income within a neighborhood rather than an SMSA.

The three area variables that were significant were the unemployment rate, employment change and relative opportunities.

A discussion of the reasons for inclusion of both an unemployment rate and an employment rate and an employment change variable was given in chapter II. The crux of the argument is that one would measure the shortrun responses by the employment change variable and the longrun structural effects with the unemployment rate variable.

From table 18 we can summarize the unemployment rate coefficients in the following way: Women who live in the SMSA's with unemployment rates below 2.5 percent have a participation rate 3-percent above women living in SMSA's with a participation rate between 2.5 and 5.0 percent. Women living in SMSA's with an unemployment rate above 5.0 percent have a participation rate about 0.5 percent below women living in SMSA's in the middle range of unemployment rates. However, the difference in participation between SMSA's having medium and high unemployment rates was not statistically significant.

In addition to the significant unemployment rate variable in table 18, the employment change variable was highly significant and negative, as our discussion in chapter II suggested. In low employment change SMSA's, adult women participated about 5 percent below women in high employment change SMSA's.

Finally, the relative opportunity variable was also highly significant and in the expected direction. As relative opportunities increased for women, their participation also increased by 6 percent between low and high relative opportunity SMSA's.

In the hours supplied regression, the only significant area variable was relative employment opportunities; the sign of the coefficient was again in the predicted direction. 39/

39/ The hours supplied regression is presented in appendix table F-8.

Table 18. Effect of area employment conditions on March participation [All women 22 and over living in largest SMSA's] 1/

| Variable | B coefficient | T value |
|---|---|---|
| Unemployment rate, 1966 average (in percent) | | |
| under 2.5 | --- | --- |
| 2.5 to 3.4 | -.0308 | -2.4 |
| 3.5 to 4.0 | -.0339 | -2.6 |
| 4.1 to 5.0 | -.0288 | -2.3 |
| 5.1 and over | -.0351 | -2.7 |
| Employment change, 1965-1966 (in percent) | | |
| Under 3.5 | --- | --- |
| 3.5 to 6.49 | .0321 | 4.2 |
| 6.5 and over | .0474 | 4.7 |
| Relative employment opportunities, 1966 (in percent) | | |
| under 62.0 | --- | --- |
| 62.0 to 73.9 | .0395 | 3.4 |
| 74.0 and over | .0586 | 3.4 |

1/ Based on appendix table F-5.

By including both FILOW and the area employment opportunity variables in the same regression, we have improved the specification of the model and increased the chances of isolating the discouraged worker effect. As employment conditions worsen (across SMSA's), women are less likely to participate, holding constant the husband's income.

Family and Demographic Variables

Differences in labor supply resulting from differences in marital status, age, race and age of children, as well as age at first marriage are discussed in the remainder of the chapter. Women are grouped into three marital status groups: Married, spouse present; never married; and other marital status.

For ever-married women, the age and number of children is an important independent variable. Women with children have to spend more time at home than women without children. Alain Girard carried out a study of the total time spent by 1,020 French urban housewives doing paid work and housework. According to his study, the time spent on homework was considerably more among women with one child than among women with no children. Among working wives, the difference was not as great as among nonworking wives. The additional time spent on homework for French mothers with more than one child was slight. (See table 19.)

A study by Morgan, et. al., (1966) for the United States in 1964 found that wives reported 40 hours per week of housework compared with 34 for single women with families and 20 for single women without families.

The age variable of the youngest child can be interpreted as reflecting differences in the cost of homework or simply tastes for paid work. We used the following categorical variables as factors affecting labor force participation: No children; children age 6 to 17; none under 3, but at least one 3 to 5; and at least one child under 3. In some regressions the mothers with no children under 3, but at least one 3 to

5, were subdivided into mothers with children 3 to 5 only and other mothers.

Table 20 presents labor force participation by race, years of schooling and number of children, holding constant all other factors.

Women with no children have the least amount of homework to do and would be most likely to participate in the labor force as evidenced by the high participation rates for this group of women. Of course, the decision not to have children might be made simultaneously with the decision to participate in the labor force. However, the increase in participation as the children get older for each level of education, and each group in table 20, suggests that there is some validity to the age of children proxy as a measure of the substitution effect between paid employment and homework. But even in this case a family might time their children to come close together if the wife had a preference for paid employment. The assumption made by Cain (1966) was that all children were unplanned. If his assumption were true, the simultaneity problem would not exist.

College graduation is an important determinant of whether married women will participate in the labor force. College graduation makes less difference for women with children under six.

From table 20 we see that Negro and other adult women with no children have a participation rate, ceteris paribus, 9 percentage points above whites. However, the rate varies by age of children, ranging from 9 points for women with no children to 23 points for women with children.

Our study did not concentrate on white-Negro differentials and, therefore, separate regressions were not run for whites and others. Some, but not all, of the Negro interaction effects were explained by the regressions. However, in regressions involving more complete specification of whites and other races integration effects and short- and long-run income terms we still obtained the 9 percentage point differential.

Table 19. Time spent by French housewives on market and nonmarket activity

| Working wives | Hours on the job including travel | Homework including child care | Total |
|---|---|---|---|
| No children..... | 51 | 27 | 78 |
| One child..... | 45 | 40 | 84 |
| Two children..... | 37 | 47 | 84 |
| Three or more children..... | 34 | 50 | 84 |
| **Nonworking wives** | **Homework excluding child care** | **Child care** | **Total** |
| No children..... | 55 | -- | 55 |
| One child..... | 53 | 17 | 70 |
| Two children..... | 56 | 19 | 75 |
| Three or more children..... | 55 | 23 | 78 |

Source: Harold Wilensky, "Women's Work: Economic Growth, Ideology, Structure," Industrial Relations (May 1968), pp. 235-248. Adapted from Alain Girard, "le hudbet--temps de la femme mariée dans les agglomérations urbanies," Population, XIII (Octobre-Decembre 1958), table XIII, pp. 606-607.

Table 20. Labor force participation by race, education, and number of children, March 1967 1/

| Years of schooling completed | White | | | |
|---|---|---|---|---|
| | Age of children | | | |
| | Some under 3 | None under 3 some 3-5 | Some 6-17 | No children |
| Under 5 years..... | 12.4 | 21.0 | 40.1 | 49.1 |
| 5 to 8 years..... | 15.6 | 24.2 | 43.3 | 52.3 |
| 9 to 11 years..... | 20.6 | 29.3 | 48.4 | 57.3 |
| 12 to 15 years..... | 26.2 | 34.8 | 53.9 | 62.9 |
| 16 years and over..... | 34.0 | 37.3 | 66.6 | 82.1 |
| | Negro and others | | | |
| Under 5 years..... | 27.3 | 44.1 | 54.6 | 58.1 |
| 5 to 8 years..... | 30.5 | 47.3 | 57.8 | 61.3 |
| 9 to 11 years..... | 35.6 | 52.3 | 62.8 | 66.4 |
| 12 to 15 years..... | 41.1 | 57.9 | 68.4 | 71.9 |
| 16 years and over..... | 48.9 | 60.4 | 81.1 | 91.2 |

1/ Married women, living with their husbands, ages 22-34, with FILOW between $1,500 and $7,499 per year living in SMSA's with medium employment change and medium relative opportunities. Based on appendix table F-7.

Contrasting participation in table 20 with the hours supplied regression in table 21, we see that while Negro and other women with no children have a participation rate 9 percentage points above that of white women, ceteris paribus. They wish to supply 100 hours less of work per year than white women. Negro and other women with children wish to supply 200 to 300 more hours per year than white women with children.

In chapterIII we discussed a number of possible reasons for the lower predicted number of hours supplied by Negro adult men.

1. They would be subject to a greater discouragement effect due to poorer opportunities and racial discrimination.

2. They are in occupations and industries where less overtime is worked. This would not normally cause a decrease in hours supplied, but because our index does not count hours of overtime desired, this explanation is plausible.

The first explanation was not supportable for men due to the insignificant difference between Negro and white participation. The second explanation was thought to be likely.

Women other than whites not only have a higher predicted participation rate than white women, they also supply more hours if they have children. None of the explanations we have used for men would be applicable for women. Even if we accepted one of the explanations for the fewer hours supplied by Negro and other women without children, we would have to explain why the presence of children reverses the relationship. The complex socio-economic factors which underlie the traditionally higher participation of women other than whites, have not been explained by use of the various independent variables--FILOW, education, age of children for interaction variables.

Another puzzling difference between white and Negro wives occurs with the hours supplied dependent variable. White wives with no children supply about 300 more hours per year than white wives with children

Table 21. Hours supplied during 1966 by race, education, and number of children 1/

(Women who worked one or more weeks during 1966)

| Years of schooling completed | White | | | |
|---|---|---|---|---|
| | Age of children | | | |
| | Some under 3 | None under 3 some 3-5 | Some 6-17 | No children |
| Under 5 years..... | 832 | 1011 | 1236 | 1509 |
| 5 to 8 years..... | 869 | 1047 | 1273 | 1546 |
| 9 to 11 years..... | 918 | 1097 | 1322 | 1595 |
| 12 to 15 years..... | 968 | 1146 | 1371 | 1645 |
| 16 years and over..... | 966 | 1171 | 1462 | 1694 |
| | Negro and others | | | |
| Under 5 years..... | 1034 | 1320 | 1466 | 1402 |
| 5 to 8 years..... | 1070 | 1356 | 1503 | 1439 |
| 9 to 11 years..... | 1120 | 1406 | 1552 | 1488 |
| 12 to 15 years..... | 1169 | 1455 | 1601 | 1538 |
| 16 years and over..... | 1167 | 1480 | 1692 | 1587 |

1/ Married women living with their husbands, ages 22 to 34, with FILOW between $1,500 and $7,499 per year living in SMSA's with medium employment changes and medium relative opportunities. Based on appendix table F-7.

6 to 17 years. However, Negro wives with children 6 to 17 supply more labor than Negro wives with no children. This contrasts with labor participation in March which is higher for both groups if the wife has no children.

The age of first marriage variable was included to test a hypothesis put forth by Alvin Schorr, that girls who marry early tend to be greatly handicapped in employment qualifications. However, women who marry early may more frequently be found in unstable family situations; these situations might require them to participate in the labor force more. According to our findings, women who marry earlier do participate more. However, since the variable was not of prime interest, no further examination of the variable was carried out. 40/

Differences in participation between married women 22 to 34 and 35 to 54 were small. However, at age 55 participation dropped sharply. The reasons for this drop are discussed in chapter II, chapter III, and the literature cited therein. The reasons usually cited are ill health and increased asset holding not reflected in the model. Another possibility is that the older women grew up in an age when participation of married women was not as common. As Steiner and Dorfman have argued, if a woman hasn't participated for a long time, she is less likely to enter the labor force than a woman who has participated recently.

Summary

Three dependent variables were used to measure labor supply: In or out of the labor force during March 1967; in or out of the labor force at any time during 1966; and the number of hours of labor supplied during 1966. Using a common set of independent variables, we explained the most variation using March 1967 participation.

Among the most important factors explaining labor supply of adult women (22 years and over) are age, marital status, years of schooling completed and total family income minus a woman's own wage and salary

40/ See appendix table F-10.

income (FILOW). For married women, race and age of children were also found to be important factors.

Holding constant other factors, labor force participation of never-married women 22 to 54 years was 36 percent above married women, spouse present, during March 1967. Women 65 and over participate much less than other groups. For never-married women, labor force participation drops by 65 percentage points from ages 22 to 54 years and to age 65 and over. The drops in participation for the other groups are less.

An estimate was made of the effect of wage changes on the supply of labor. If we had adequately standardized for all differences among adult women in our model, we could infer that an increase in real wages of 10 percent would lead to a maximum 2 to 4 percent increase in hours supplied or the probability of participating for any given individual. This result is very speculative and requires further study. At the very least, more study should be given to the relationship between years of schooling, wages and labor supply.

FILOW was negatively associated with participation. Women with FILOW between $1,500 and $7,500 in 1966 had a participation rate 15.1 percentage points below women with FILOW below $1,500. Women with FILOW above $7,500 had a participation rate 23.6 percentage points below women with FILOW below $1,500 during March 1967, ceteris paribus. FILOW was also negatively associated with participation during the year and hours supplied.

Variables were also included in the regression to reflect differences in the opportunities available to women among SMSA's. If obtaining a job was considered difficult and job search time was considered costly in a particular SMSA, we would expect less participation, ceteris paribus. Three area variables were included in our regressions and were statistically significant: Area unemployment, area employment change, and relative opportunities available to women. Together these variables can account for differences of as much as 14 percentage

points in labor force participation rates between favorable and unfavorable SMSA's. Labor force participation was higher in SMSA's at or near full employment as measured by an unemployment rate above 2.5 percent, where employment increased most rapidly and in areas where relative opportunities for women were greatest. Of these three factors, the unemployment rate was the least significant.

The relative opportunities available to women in the SMSA of residence was also a significant determinant of the number of hours she wished to supply, but the other area variables were not significant.

During March 1967, Negroes and other married women with no children had a labor force participation rate 9 percent above white women with no children after account is taken of other factors affecting participation. The differential jumps to 23 percent, ceteris paribus, for these women with some children 3 to 5.

The presence of children for both white and other mothers lowered participation. In addition, the age of the youngest child had an extremely significant influence on participation. In March 1967, mothers with young children under 3 participate by 37 percentage points below women with no children, ceteris paribus.

On the average, married women 22 and over living with their husbands wished to supply an average of 1,400 hours during 1966. This average was calculated only for women who worked one or more weeks during 1966 and who lived in one of the largest 96 SMSA's. Years of schooling was positively related to the number of hours supplied. Age was negatively associated with hours supplied. White women with children under 3 wished to supply only half as many hours as white women with no children, ceteris paribus. However, the probability of a woman with children under three participating at all is quite low.

## Chapter V. Labor Supply of Youth

Introduction

Dramatic increases in population, in school enrollment, and in unemployment rates of youth have characterized the 1947-1968 period. Tables 22 and 23 highlight these and other trends for 16 to 19 year-olds. The number of youths actually fell in the early 50's. However, a substantial upward jump in the youth population occurred in the late 50's and early 60's. This population growth declined somewhat after 1965 and is projected to grow at the slower rate in the next few years.

Youth labor force increases followed the population growth but at a slightly slower pace. Participation rates of 16-19 year-olds dropped from 52.5 percent to 48.3 percent in the 1948-68 period. Still, after only a 400,000 increase in the youth labor force from 1948-1960, the 16-19 year-old labor force grew by almost 2 million during the next eight years. Many believe that this rapid youth labor force increase accounts for much of the worsening in youth unemployment rates. Note in table 22 that the higher youth unemployment rates were recorded in 1960 and 1964, the period of the most rapid increase in the population of persons 16 to 19 years old. Youth unemployment as a ratio of total unemployment was also considerably higher in the sixties than the fifties. Of course other events were going on in the sixties. The minimum wage was escalated by 60 percent; we had the longest post-war sustained boom; and, the Vietnam war contributed to the tight labor market.

Steady increases in school enrollment rates occurred throughout the post-war period. Over two-thirds of 16-19 year-olds enrolled in school in October 1967 as compared with about one-half in the early 1950's. As more youths enrolled in school, a higher percentage of them participated in the labor force. At the same time a small decline occurred between 1953 and 1967 in the percentage of nonstudents participating in the

Table 22. Trends in youth population, labor force participation and unemployment rates 1/

| | 1948 | 1952 | 1956 | 1960 | 1964 | 1968 |
|---|---|---|---|---|---|---|
| Both sexes, 16 to 19 years old | | | | | | |
| Population (in 000's)..... | 8451 | 7924 | 8434 | 10186 | 12930 | 13698 |
| Labor force (in 000's).... | 4435 | 4036 | 4296 | 4840 | 5910 | 6618 |
| Labor force participation rate..... | 52.5 | 50.9 | 50.9 | 47.5 | 45.7 | 48.3 |
| Unemployment rate..... | 9.2 | 8.5 | 11.1 | 14.7 | 14.8 | 12.7 |
| Both sexes, 16 years and over | | | | | | |
| Unemployment rate..... | 3.8 | 3.0 | 4.1 | 5.5 | 4.5 | 3.6 |
| Ratio of 16-19 unemployment rate to 16 and over unemployment rate.. | 2.4 | 2.8 | 2.7 | 2.7 | 3.3 | 3.5 |

1/ Civilian, noninstitutional population.

*Source:* U.S. Department of Labor, Statistics on Manpower, A Supplement to the Manpower Report of the President, March 1969.

labor force. Explanations of these trends point to the changing composition of student and nonstudent groups. The larger percentage of students contains a higher proportion of youths from low and middle income groups; this compositional change may explain part of the rise in student participation rates. The fact that those unable to work or attend school for reasons of illness and other disabilities make up a larger fraction of the declining nonstudent percentage may contribute to the lower nonstudent participation rates.

Unemployment rates for both student and nonstudent groups rose substantially in the postwar period. Since students made up a much greater percent of the youth labor force in 1967 than in 1953, most of the increased numbers of unemployed youths were students. Nevertheless, it is a mistake to attribute the rising youth unemployment rates purely to a glutting of the student labor market. The data in table 23 show that nonstudent unemployment rates also increased in the 1953-67 period.

Table 24 provides a picture of the postwar changes in labor force participation and unemployment rates by age, race, and sex in three high employment years. Participation rates decreased for young men of both races although the rates of nonwhite men dropped more than those of white men. Young women of both races participated at about the same rates throughout the postwar period. The unemployment rate, however, differed markedly by race. The worsening in nonwhite unemployment rates dwarfed the small increases in unemployment rates observed in the case of young whites. Young white men 16 to 19 saw no poorer employment opportunities in 1968 than in 1948. Substantial increases did occur in the unemployment rates of young white women. However, these increases did not approach in severity the worsening market situation faced by young nonwhites. It appears that any explanation of rising youth unemployment should focus on the increasing difficulties of young white women and young nonwhites.

Table 23. Trends in school enrollment and labor force participation and unemployment rates by enrollment status

| | 1953 | 1956 | 1960 | 1964 | 1967 |
|---|---|---|---|---|---|
| Both sexes, 16 to 19 years old | | | | | |
| School enrollment percentage..... | 54.2 | 58.2 | 62.3 | 68.0 | 59.3 |
| Enrolled: | | | | | |
| Labor force participation rate... | 24.1 | 32.2 | 29.5 | 28.7 | 35.0 |
| Unemployment rate..... | 4.9 | 6.7 | 10.0 | 11.2 | 12.4 |
| Unemployment (in thousands)..... | 52 | 106 | 189 | 269 | 403 |
| Not enrolled: | | | | | |
| Labor force participation rate... | 73.3 | 70.3 | 71.1 | 68.7 | 69.7 |
| Unemployment rate..... | 6.8 | 7.5 | 15.6 | 15.3 | 14.8 |
| Unemployment (in thousands)..... | 183 | 188 | 432 | 415 | 425 |

Source: See table 22.

Table 24. Labor force participation rates and unemployment rates by age, race, and sex

| | | | 1948 | 1957 | 1968 |
|---|---|---|---|---|---|
| Labor force participation rates | | | | | |
| Males | 16 to 17 | White..... | 51.2 | 49.6 | 47.7 |
| | | Negro and other..... | 59.8 | 47.5 | 37.9 |
| | 18 to 19 | White..... | 76.2 | 71.6 | 65.7 |
| | | Negro and other..... | 77.8 | 72.0 | 63.3 |
| Females | 16 to 17 | White..... | 31.7 | 32.1 | 33.0 |
| | | Negro and other..... | 29.1 | 24.1 | 23.3 |
| | 18 to 19 | White..... | 53.5 | 52.6 | 53.3 |
| | | Negro and other..... | 41.2 | 42.8 | 46.9 |
| Unemployment rates | | | | | |
| Males | 16 to 17 | White..... | 10.2 | 11.9 | 12.3 |
| | | Negro and other..... | 9.4 | 16.3 | 26.6 |
| | 18 to 19 | White..... | 9.4 | 11.2 | 8.2 |
| | | Negro and other..... | 10.5 | 20.0 | 19.0 |
| Females | 16 to 17 | White..... | 9.7 | 11.9 | 13.9 |
| | | Negro and other..... | 11.8 | 18.3 | 33.7 |
| | 18 to 19 | White..... | 6.8 | 7.9 | 11.0 |
| | | Negro and other..... | 14.6 | 21.3 | 26.2 |

Source: See table 21.

Much of the previous empirical work on youth participation has dealt with the cyclical sensitivity of the youth labor force. Investigators (Dernburg and Strand; Tella, 1965; Mincer, 1966) have agreed that improvements in general employment conditions tend to increase youth participation although their estimates of the size of these effects differ. The fact that youth participation moves with general employment changes is consistent with the discouraged worker effect having a larger influence on the youth labor force than the added worker effect. This conclusion holds for time series and for cross section studies.

Other studies have examined added worker and income effects from a cross section standpoint. As calculated by Korbel (1966) and by Bowen and Finegan (1965), the effects on youth participation of other family income and of the head's employment status were surprisingly weak. Both studies used the 1/1000 tape of the 1960 U.S. Census. Bowen and Finegan also examined the labor force impact of a number of variables on youth subgroups disaggregated by age, sex, and school enrollment status. A major findings is that student participation appears less subject to the discouragement effects of poor employment conditions than does nonstudent participation. Their explanation is that area employment conditions have a dual influence on youth school activity and youth participation which biases measured discouraged worker effects downward. If high employment areas tend to attract students into the labor force and at the same time influence many to become nonstudents, the actual relation between area conditions and student participation becomes difficult to observe.

This chapter examines four major hypotheses and a number of related ones. The results provide new, more detailed tests of hypotheses on the supply of labor by youths. Each set of hypotheses is discussed from a theoretical standpoint and then tested empirically. The major hypotheses appear in the following order: The discouraged worker hypothesis, a wage rate hypothesis, the added worker influence are noted. A discussion

follows on other interesting results that do not fit neatly into any of the major hypotheses. Finally, the explanatory power of the regressions as a whole is appraised.

Discouraged Worker Effects: The Hypotheses

Poor employment conditions discourage many potential workers from searching for jobs and good employment conditions attract them into the labor force. The discouraged worker effects are isolated from additional worker effects and discouragement is analyzed in detail by testing a number of hypotheses. In addition, we ask which youth subgroups display the larger discouragement effects. We measure the effects using different concepts of labor supply and different SMSA employment variables.

Hypothesis (1): SMSA employment conditions made a stronger impact on participation in the March 1967 survey week than on participation at any time in 1966 and on hours supplied in 1966.

This hypothesis follows from Mincer's remarks on the timing of labor force participation. He argued that the youth labor force sensitivity to employment conditions observed in time series studies does not imply the existence of hidden employment or a loss in total potential output. Youths may simply alter the timing rather than the total amount of labor supplied in response to changing employment conditions. Since most studies have used a dichotomous labor supply concept--in or out of the labor force in the CPS survey week--it is difficult to determine if 1) youths make a decision independent of employment conditions on their desired amounts of labor supply over a long period and simply base the timing of labor supply on employment conditions, or 2) if youths vary their desired amounts of labor supplied in response to employment conditions. Of course, a year is not a long enough period to firmly establish or refute Mincer's hypothesis.

The access to three labor supply measures allows us to perform a test of the Mincer hypothesis. As discussed in chapter II, the three measures are: In or out of the labor force in March 1967, in or not in

the labor force at any time in 1966, and hours supplied in 1966. If youths do fix the amount supplied over a year, then the SMSA unemployment rate should not exert a significant influence on the number who participated in 1966 nor on the average number of hours per participant. A significant effect from employment conditions on 1966 participation or on hours supplied in 1966 is inconsistent with the Mincer hypothesis. 41/

Hypothesis (2): Disadvantaged or marginal workers become discouraged from labor force participation to a greater extent than do other workers.

This hypothesis takes two forms. First, disadvantaged and marginal workers participate at less than average rates because their unemployment rates are higher than average. A Negro, a poverty tract resident, or a non-high school graduate may have greater than average difficulties in finding a job. It is possible that observed negative effects from these variables reflect taste differences. However, higher discouragement by those suffering the most unemployment appears as a more plausible explanation.

The second aspect of the hypothesis involves the type of discouragement usually measured in cross section studies. This measure of discouragement is the sensitivity of participation to differences across SMSA's in employment conditions. According to the hypothesis (2), participation rates of marginal subgroups differ more as a result of differences in SMSA employment conditions than do rates of other groups. Oi has demonstrated that employment among less skilled, less permanent workers fluctuates more in response to short-run demand changes than among others. This is due to the higher training and hiring costs required for highly skilled groups (Oi). Thurow has provided evidence that fluctuations in aggregate demand help or hurt marginal workers much more than other workers. The high sensitivity to changes in aggregate demand suggests that general differences in SMSA labor market

41/ The time period over which the SMSA labor market variables were measured may contribute to higher discouragement in the 1966 measures than in the 1967 measure. The area employment variables are 12 month annual averages for 1966. Rates based on 1966 employment conditions would be expected to exert a greater influence on 1966 measures than on 1967 measures of participation.

conditions may also exert a disproportionate influence on marginal workers. It is plausible that larger differences in employment across SMSA's lead to larger differences in participation.

Hypothesis (3): Participation of students is more sensitive to differences in SMSA labor market conditions than is the participation of nonstudents.

Students generally participate on a parttime basis while most nonstudent participants are in the fulltime labor force. Note in table 25 that the student work week averages about half the hours contained in the nonstudent work week. The parttime nature of student work has two implications related to discouragement effects. First, it probably does not cost twice as much to find a 40 hour a week job as it does to find a 20 hour a week job at a given wage. Thus, we expect that student participation is more highly sensitive than is nonstudent participation to differences in search costs, which are reflected by differences in employment conditions. Second, parttime youth employment opportunities may fluctuate more in response to general employment conditions than do fulltime opportunities since a parttime worker is probably a more variable factor than is a fulltime worker. In turn, parttime participation would differ more than fulltime as a result of the larger employment fluctuations.

Another reason for the larger labor force sensitivity of school youth is the already large labor force participation of non-school youth. Kalachek (1968) reports that during the school months of 1967, the percentage of male youth, not in school, not incapacitated, and not in the labor force was less than 5 percent. This fact is not strong evidence against high labor force sensitivity for out-of-school youth, since employment conditions had improved substantially by 1967 from previous years. However, strong evidence for a low discouragement effect on out-of-school youth comes from a study made in 1963, a year of poorer employment conditions, that reported only 8 percent of all out-of-school

Table 25. Labor force commitment by school activity, age, and sex

| Age and sex | Percent of workers part time | | Average hours | |
|---|---|---|---|---|
| | School | Not school | School | Not school |
| Male: | | | | |
| 14 to 17..... | 93.4 | 17.4 | 13 | 35 |
| 16 to 17..... | 91.8 | 13.0 | -- | -- |
| 18 to 19..... | 70.4 | 4.2 | 23 | 41 |
| 20 to 24..... | 48.0 | 1.8 | 29 | 44 |
| Female: | | | | |
| 14 to 17..... | 96.9 | 18.3 | 10 | 33 |
| 16 to 17..... | 96.5 | 18.8 | -- | -- |
| 18 to 19..... | 77.9 | 10.9 | 19 | 37 |
| 20 to 24..... | 53.3 | 10.4 | 26 | 38 |

Source: Vera C. Perrella, "Employment of School Age Youth, October 1966," Special Labor Force Report 87, Bureau of Labor Statistics, tables A, B, and E.

males, 16 to 21, were not in the labor force. Of the out-of-school nonparticipants, only 7 percent of the males and 3 percent of the females used unavailability of work as their main reason for nonparticipation (Perrella and Bogan).

An offsetting factor involves school-work linkages. If low unemployment encourages youths to leave school and to enter the labor force, we may observe higher labor force sensitivity among nonstudents than among students. The student youths that do respond to employment gains become classified as nonstudents. This implies that increasing tightness may increase participation of youths as a whole without changing student participation rates. 42/

Hypothesis (4): SMSA employment change differences have a stronger effect on youth participation than do SMSA unemployment rate differences.

There are two lines of reasoning that indicate youth employment is more sensitive to employment change than to the unemployment rate. We argue that if youth employment depends more heavily on employment change, youth participation should follow the same pattern.

Kalachek (1966), in explaining relatively high youth unemployment rates, argued that it is both the level and the path of unemployment rates that determines the structure of unemployment. Flows into unemployment result from quits, layoffs, and new entrants. Given the unemployment rate, a stable path of unemployment rates leads to a higher percent of new entrants and a lower percent of layoffs among the unemployed than does an unstable path. If two SMSA's have the same unemployment rate, the SMSA with the higher percent change in employment probably has experienced the less stable path of unemployment rates. Thus, a high percent change in SMSA employment has a strong effect on the employment and participation of new entrants, a group to which a high percent of youths belong.

42/ Bowen and Finegan (1966) make this argument in explaining their results showing higher discouragement effects among nonstudents than among students.

Another reason for the larger effect of employment change follows from Reder's theoretical analysis of frictional unemployment. Reder points out that the labor force composition of SMSA's accounts for some of the differences in unemployment rates. Those SMSA's with high ratios of "temporaries" to "permanents" have high frictional unemployment. This cause of differing SMSA unemployment does not affect the job opportunities of particular "temporaries" across SMSA's. The employment change variable, which does not reflect these compositional differences, should exert a greater impact on participation than the unemployment rate.

Hypothesis (5): The job opportunities of youths relative to those of adults across SMSA's has a larger impact on youth participation than do SMSA differences in general labor market conditions.

Unless youths have poor information, one would expect that the most accurate measure of youth job chances also exerts the largest influence on youth participation. Unfortunately, the use of youth specific measures would result in substantial spurious correlation between the youth employment conditions measure and youth participation. In order to test a youth oriented measure and to avoid spurious correlation, we examined a variable, discussed in chapter II, that reflects the opportunities of youths relative to those of adults.

It is not clear a priori whether the relative or general measure of SMSA employment conditions has the largest impact on youth participation. If the Oi and Thurow time series studies regarding the sensitivity of youth employment to general market conditions apply to the case of cross section differences in conditions, then youths, as marginal workers relative to adults, may display a large participation response to the SMSA unemployment and to SMSA employment change. Alternatively, the youth market may not be closely linked to the general SMSA market situation. In that case structural factors across SMSA's producing differences in relative opportunities of youths may have the largest influence on youth participation.

Tests of Youth Participation Hypotheses

Results from many regressions on a labor supply dependent variable provided tests of hypotheses examined in this chapter. As stated in chapter II, all of the regressions used individuals as observations and only dummy independent variables.

In this chapter we report only those coefficients and significance levels that bear directly on each hypothesis. These results are taken from separate regressions for subgroups of the population. The regressions in their complete form appear in appendix G.

The definition of in-school throughout this study is based on the major activity of a youth rather than on his enrollment status. An individual's major activity is the activity at which he spends the longest amount of time during the survey week. A person is enrolled in school if he attends any regular school, parttime or fulltime, night or day. Thus, a person may be enrolled in school even if his major activity is something other than school. One can see from table 26 that the practical differences between the two measures are minor except for white males. It was necessary to use major activity status since school enrollment data were not available in March 1967.

Discouraged Worker Effects: Results

Hypothesis (1): SMSA employment conditions make a stronger impact on March participation than on 1966 participation and on hours supplied in 1966.

The results were not consistent with Hypothesis (1) and with the Mincer argument that employment conditions affect the timing but not the amount of labor supplied. High SMSA unemployment rates induced a negative influence on the percent of youths participating at any time during 1966. The extent of the effect was at least as large as the effect on March participation. Note in table 27, that according to either labor supply concept high SMSA unemployment rates meant substantially lower participation rates for nonstudents and in some case

Table 26. School status: A comparison of major activity status and school enrollment status, age 16-21, October 1966

(In thousands)

| Major activity status, sex and race | School | | | | Nonschool | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Employed | Unemployed | NILF | Total | Employed | Unemployed | NILF |
| White male: | | | | | | | | |
| School enrollment status..... | 5,259 | 1,909 | 161 | 3,189 | 2,521 | 2,094 | 167 | 260 |
| Major activity status..... | 4,979 | 1,645 | 160 | 3,174 | 2,617 | 2,240 | 162 | 215 |
| White female: | | | | | | | | |
| School enrollment status..... | 4,359 | 1,229 | 95 | 3,035 | 4,226 | 2,252 | 258 | 1,716 |
| Major activity status..... | 4,326 | 1,103 | 96 | 3,127 | 4,212 | 2,357 | 256 | 1,599 |
| Negro and other male: | | | | | | | | |
| School enrollment status..... | 643 | 158 | 28 | 457 | 496 | 382 | 50 | 64 |
| Major activity status..... | 618 | 135 | 25 | 458 | 495 | 387 | 50 | 58 |
| Negro and other female: | | | | | | | | |
| School enrollment status..... | 575 | 98 | 31 | 446 | 693 | 275 | 103 | 315 |
| Major activity status..... | 560 | 77 | 24 | 459 | 679 | 283 | 108 | 288 |

Source: Vera C. Perrella. "Employment of School Age Youth, October 1966," Special Labor Force Report, No. 87, and unpublished BLS data.

Table 27. Discouragement effects on participation in 1966 and in March 1967

| Unemployment rates and selected interactions | March 1967 participation 1/ | | 1966 participation 2/ | |
|---|---|---|---|---|
| | B coefficient | T value 3/ | B coefficient | T value 3/ |
| 1966 unemployment rates: 4/ | | | | |
| 0 to 2.4..... | --- | --- | --- | --- |
| 2.5 to 3.4..... | -.0051 | - .3 | -.0207 | - .6 |
| 3.5 to 4.0..... | -.0086 | - .4 | -.0424 | - 1.3 |
| 4.1 to 5.0..... | -.0148 | - .5 | -.0625 | - 2.0 |
| 5.1 and over..... | -.0996 | - 2.9 | -.1157 | - 3.5 |
| Selected interactions: (in percent) | | | | |
| Students 4.1 to 5.0..... | -.0638 | - 2.4 | -.0102 | - .3 |
| Students 5.1 and over... | .1347 | 4.5 | .0918 | 2.2 |

1/ These results are taken from regression G-14.

2/ These results are taken from regression C-16.

3/ These T Values are uncorrected for heteroscedasticity. See the discussion in appendix E on estimates of standard errors in regressions with dichotomous dependent variables.

4/ Many other interactions with the unemployment rate appeared in each of these regressions.

for students as well. The expected differential effects on students and nonstudents were discussed in the previous section.

Comparing the significance of SMSA effects on March participation with those on hours supplied in 1966, we find more significant discouragement effects using the March concept. Although SMSA employment change and SMSA relative opportunities both influenced March participation, neither was significant in the hours supplied regressions. A significant term in one regression indicated that youths in SMSA's with unemployment rates over 5 percent supplied about 75 fewer hours than youths in SMSA's with unemployment under 5 percent. However, the over 5 percent term was not significant in another hours supplied regression. 43/ Thus, there is no convincing evidence that poor SMSA employment conditions produce a negative impact on the number of hours supplied in 1966 per labor force participant. Nevertheless, the fact that high SMSA unemployment rates discouraged many youths from participating at all during 1966 indicates that poor employment conditions may reduce the total amount of labor supplied and in turn, may reduce potential output.

Hypothesis (2): Disadvantaged or marginal workers become discouraged from labor force participation to a greater extent than do advantaged workers.

The evidence is mixed with respect to hypothesis (2). As noted above we examine two kinds of discouragement. One is the discouragement resulting from generally poorer than average job opportunities available to Negro youths, youths living in poverty tracts, and youths who have not graduated from high school. The test is to examine basic subgroup effects while holding other variables, such as SMSA labor market conditions, constant. These subgroup terms may capture differences in tastes in addition to the differences in group specific employment opportunities.

43/ The variables held constant while testing the impact of SMSA employment conditions variables were age, sex, race, residence in or out of a poverty tract, and weeks unemployed of family head. See regressions B-17 and B-18.

We compare basic effects of age, race, poverty tract residence, and high school graduation in table 28. In almost every case the less advantaged groups displayed lower participation. Taste differences may play a role, especially with respect to the low participation of out-of-school 16 to 17 year-olds. The positive effect of high school graduation may in part result from higher motivation displayed by graduates than by nongraduates. Still the major source of participation differences in education is probably the substantial unemployment rate differences.

A second aspect of hypothesis (4) is the extent to which disadvantaged groups differ from advantaged groups in responding to differences across SMSA's in employment conditions. We examined this hypothesis by using interaction effects between a labor market variable and a labor subgroup variable. For example, we multiplied the Negro level of the race variable times each level of the unemployment rate variable. Results of these interactions terms tell whether the unemployment rate has a significantly different effect on Negro youths than on others.

The results were not consistent with this hypothesis for two of the three subgroups tested. Extensive tests of labor force responses by race showed no significant differences. We used all three labor market variables in these tests. Poverty tract residence also appeared to make no difference in the youth sensitivity to SMSA employment conditions. The exception is that high school graduates did display smaller discouragement effects than nongraduates. These smaller effects occurring in the case of students meant that participation of youths attending college was less sensitive to SMSA differences in employment conditions than was participation of youths attending high school. These results appear in table 29.

The absence of racial and residential differences in response to SMSA variables is not easy to understand. Thurow showed that Negro youths gain and lose disproportionately from aggregate changes in

Table 28. Basic effects of subgroup differences: March 1967

| Age, race, residence and educational attainment | Students 1/ | | Nonstudents 2/ | |
|---|---|---|---|---|
| | B coefficient | T value 3/ | B coefficient | T value 3/ |
| Age: | | | | |
| 16 to 17 | --- | --- | --- | --- |
| 18 to 19 | .0318 | 2.1 | .2142 | 8.4 |
| 20 to 21 | -.0362 | - 1.7 | .2363 | 8.9 |
| Race: | | | | |
| White | --- | --- | --- | --- |
| Negro | -.0883 | - 3.5 | -.0642 | - 2.4 |
| Residence: | | | | |
| Not poverty tract | --- | --- | --- | --- |
| Poverty tract | .0035 | .2 | -.0497 | - 2.1 |

| | Students and nonstudents | |
|---|---|---|
| | B coefficient | T value 3/ |
| Educational attainment: 4/ | | |
| Not high school graduate | --- | --- |
| High school graduate | .0697 | 4.79 |

1/ These results are taken from regression G-1.

2/ These results are taken from regression G-5.

3/ See footnote 3 in table 27.

4/ These results are taken from regression G-12.

Table 29. Sensitivity of March 1967 labor force participation rates of high school graduates and non-graduates to SMSA employment conditions (1966 average)

| Item | College youth | High school youth |
|---|---|---|
| Relative opportunities: 1/ | 64.0 | 37.7 |
| 0 to 71..... | 64.0 | 37.7 |
| 72 to 89..... | 50.6 | 48.7 |
| 90 and over..... | 59.7 | 54.2 |
| | High school graduates | Non-graduates |
| Unemployment rates: 2/, 3/ | | |
| 0 to 2.5..... | 82.9 | 80.2 |
| 4.1 to 5.0..... | 87.2 | 78.0 |
| 5.1 and over..... | 77.2 | 69.5 |

Note: The labor force participation rates reported above are predicted rates for the specific youth subgroups listed in the footnotes below. However, the differences in predicted rates by school level and by SMSA employment conditions that appear in the table above also apply to other age, race, sex, and FILOW groups.

1/ Predictions for white males, 18 to 19 years old, not a family head, with FILOW from 0 to $3,000, and living in an SMSA with a 0 to 2.5 percent unemployment rate. These results are taken from regression G-11.

2/ Predictions for white males, 18 to 19 years old, not a family head, with FILOW from 0 to $3,000, and living in an SMSA with a 72 to 89 percent range of relative opportunities. These results are taken from regression G-13.

3/ Not all unemployment categories are included since only two unemployment rate-high school graduate interaction terms were calculated.

employment. This high sensitivity to general conditions apparently does not extend to area SMSA labor market variables. 44/

Hypothesis (3): Participation of students is more sensitive to differences in SMSA labor market conditions than is the participation of nonstudents.

The results noted in table 30 provide support for this hypothesis. In the case of unemployment rate effects, the results were the reverse of those expected.

High unemployment rates discouraged some nonstudents from participating. However, the effects were clearly nonlinear on students and nonstudents. Within the 0 to 5 percent range SMSA unemployment rates differences produced no effect on youth participation. Ceteris paribus, SMSA's with unemployment rates above 5 percent displayed lower participation among nonstudents and higher participation among students than other SMSA's. 45/ Although it is difficult to explain the significant positive effect on student participation, school-work linkages may help and are discussed below.

Employment change influenced student but not nonstudent participation. Again the observed effects were nonlinear. Areas with the lowest percentage employment change had lower student participation than other areas. However, little difference occurred in student participation within the medium and high range of employment change. One explanation of the absence of significant employment change effects on nonstudents involves the Kalachek point that the path of employment rates affects the structure of unemployment. We applied this point in arguing that employment change has the stronger effect on the job chances and, in turn, on participation of new entrants. If students are new entrants to a greater extent than are nonstudents, it follows that employment change would have a greater effect on students.

44/ Evidence on youth employment rate sensitivity to SMSA employment conditions supports this point. See Lerman.

45/ These results occurred not only in tables G-1 and G-5 but also in tables G-3 and G-7.

Table 30. Discouragement effects by school activity

(In percent)

| Item | Students 1/ | | Nonstudents 2/ | |
|---|---|---|---|---|
| | B coefficient | T value 3/ | B coefficient | T value 3/ |
| Unemployment rates: (1966 average) | | | | |
| 0 - 2.4..... | --- | --- | --- | --- |
| 2.5 - 3.4..... | -.0139 | - 0.5 | -.0197 | - 0.5 |
| 3.5 - 4.0..... | .0245 | 0.8 | .0029 | 0.1 |
| 4.1 - 5.0..... | -.0086 | - 0.3 | .0026 | 0.1 |
| 5.1 and over..... | .0566 | 1.9 | -.0745 | - 1.9 |
| Employment change: (1965 to 1966) | | | | |
| 0 - 3.49..... | --- | --- | --- | --- |
| 3.50 - 5.49..... | .1022 | 5.3 | .0045 | 0.2 |
| 5.50 - 6.49..... | .1167 | 5.5 | .0139 | 0.5 |
| 6.50 and over..... | .1165 | 3.8 | -.0532 | - 1.4 |
| Relative opportunities: (1966 average) | | | | |
| 0 - 71..... | --- | --- | --- | --- |
| 72 - 89..... | .0815 | 3.0 | .0843 | 2.6 |
| 90 and over..... | .1731 | 4.9 | .1144 | 2.7 |

1/ These results are taken from regression G-1.

2/ These results are taken from regression G-5.

3/ See footnote 3 in table 27.

Another explanation of the inconsistent effects of the two SMSA variables on students and nonstudents involves school-work linkages. Tight labor markets encourage high participation and low school enrollment for youths as a whole. But youths must incur costs if they change their enrollment decision after the beginning of the school year. For this reason, school enrollment depends on the expected state of the labor market during the coming school year. If the unemployment rate is a more stable long-run variable than is employment change across SMSA's, enrollment decisions are probably based more on the unemployment rate than on employment change. Thus, a low unemployment rate may not induce a high student participation rate since many students who are encouraged to enter the labor force would leave school in order to work. At the same time, high percentage employment change, a more short-run phenomena, encourages students to participate without affecting their enrollment decision. Area labor market effects on school enrollment provide evidence for this argument (Lerman).

The effects of the relative opportunities variable are consistent with hypothesis (3). Results from other regressions demonstrate larger differences between the relative opportunities effects on students and those on nonstudents.

Looking at all three SMSA variables, we find that discouragement effects on students are on balance larger than effects on nonstudents and that nonlinearities exist in the discouragement effects on students and nonstudents.

Hypothesis (4): SMSA employment change differences have a stronger effect on youth participation than do SMSA unemployment rate differences.

We discussed above the differential effects of employment change and unemployment rate variables on students and nonstudents. A review of these results shows them to be consistent with hypothesis (4) in two ways. First, the size of the employment change coefficients on

students were larger than the unemployment rate coefficients on non-students. Second, since most youths are students, the impact of SMSA employment change is more widespread than that of the SMSA unemployment rate. Both factors are evidence for hypothesis (4) and for the Kalachek argument that new entrants benefit when a given unemployment rate is achieved through an unstable path of rates.

Hypothesis (5): The job opportunities of youths relative to those of adults across SMSA's have a larger impact on youth participation than do SMSA differences in general labor market conditions.

The results in table 30 provide evidence for hypothesis (5). The larger impact of the relative opportunities variable on youth participation occurred in every regression in which relative and general SMSA labor market variables appeared.

Additional Worker Effects

The hypotheses. The basic hypothesis is that secondary workers in the family enter the labor force in response to the unemployment of the family head. In terms of the family utility model presented in chapter III, youth labor hours increase with a ceteris paribus fall in family income. Another line of reasoning is that the family head's unemployment decreases permanent income. To sustain the family's permanent consumption level, the family must engage in asset decumulation or replace the head's earnings with earnings of other family members.

Hypothesis (7): Added worker effects are more important in low income families than in high income families.

Mincer (1966) argued for this hypothesis by noting that low income families cannot use the asset decumulation alternative as much as other families can. On the other hand, estimates of permanent income by low and middle income families may include an expected amount of unemployment. The head's unemployment may not imply negative transitory income but rather may signify an expected layoff. In this case, neither labor

force entrance by secondary workers nor asset decumulation is required to maintain consumption levels.

Hypothesis (8): Negro youths and youths living in poverty tracts enter the labor force in response to the family head's unemployment at higher rates than other youths do.

Negro and poverty tract families probably hold fewer assets than other families at the same income levels. 46/ Although we control for family income less own wages of youth (FILOW), there are no direct asset measures included in the regressions. Unearned income included in FILOW includes interest and rents derived from income paying assets. Negro and poverty tract variables may reflect some of the assets differences. Since low asset holdings limit asset decumulation as an alternative to added worker effects, Negro and poverty tract families may encourage their youths to enter the labor force at higher rates than other families.

A factor that may offset this reasoning is differences in family structure. If Negro and poverty tract families have weaker family structure or structures not based on legal family ties, youths in these groups may exhibit a smaller response to the family head's unemployment.

Hypothesis (9): Nonstudents display a larger added worker effect than students do.

The first argument for this result depends on the nature of the data. Data on school activity exist only at one point in time. We are not able to discern changes in school activity that may accompany changes in labor force status. Youths who leave school to enter the labor force fall into the nonparticipating student category if they enter the survey before the changes or the participating nonstudent category if they enter after the changes. Although, in fact, students may perform the added worker function as much as nonstudents, we may observe a smaller effect since

46/ Although Negro savings are higher than average for a given income class, their holdings of major assets are lower than average. See The Negroes in the United States: Their Economic and Social Situation, BLS Bulletin 1511, 1966, pp. 152-154.

some of these students ma also leave school in response to the family head's unemployment.

Another reason for a small added worker effect on students is the fact that students, as part-time workers, can make up only a very minor part of the family income loss resulting from the head's unemployment.

Hypothesis (10): Additional worker effects increase in size as the duration of family head's unemployment increases.

Some family heads incur brief periods of unemployment in moving from one job to another. Youths in these families are unlikely to enter the labor force since the family income loss is very small. As the duration of unemployment increases, the need for other family income increases. In addition, longer unemployment periods allow for lags between the head's unemployment and the youth's labor force response.

On the other hand, families may adjust permanent family income and permanent consumption downward as the duration of the family head's unemployment increases. Added worker effects decline with lengthening family head unemployment according to this logic. Long term unemployment in March 1967 may also indicate that the family head suffers from personal or other problems not reflected by the other variables included in the regression. His child may have inherited these problems and may not participate because of his slim chances for employment or because of his perception of slim chances.

Additional Worker Effects: Results. The results varied a great deal by subgroup and by unemployment variable. Added worker effects appeared unimportant for major groups. Within these groups, we did find some substantial effects.

Table 31 displays some evidence for the hypothesis (7) that added worker effects are more important in low income than in high income families. Nonstudent youths exhibited this tendency in an especially pronounced way. The income-interaction terms for students were not statistically significant although the coefficients were large and

Table 31. Additional worker effects by school activity and by family income

| FILOW 3/ | Labor force participation rates (in percent) | | | |
|---|---|---|---|---|
| | White students 1/ | | White nonstudents 1/ | |
| | Head employed 2/ | Head unemployed | Head employed 2/ | Head unemployed |
| 0 to $ 2,999.. | 38.8 | 46.3 | 72.3 | 100.0 |
| $ 3,000 to $ 5,999.. | 36.2 | 32.9 | 73.8 | 67.2 |
| $ 6,000 to $ 9,999.. | 35.7 | 36.8 | 73.6 | 69.0 |
| $10,000 to $14,999.. | 35.2 | 41.3 | 75.8 | 47.8 |
| $15,000 and over.... | 34.4 | 35.5 | 71.8 | 78.0 |
| FILOW 3/ | Negro students 4/ | | White nonstudents 4/ | |
| | Head employed 2/ | Head unemployed | Head employed 2/ | Head unemployed |
| $ 0 to $3,000... | 22.6 | 51.4 | 59.6 | 72.8 |

Note: The labor force participation rates reported above are predicted rates for the specific youth subgroups listed in the footnotes below. However, the differences in predicted rates by employment status of family head that appear in the table also apply to groups with other individual characteristics and facing other area labor market conditions.

1/ These results are taken from regressions G-4 and G-8, respectively. The participation rates are predictions for males, 16 to 17 years old, living in 96 of largest 104 SMSA's with 0 to 2.5 percent unemployment rates, 3.5 to 6.4 percent employment change, and 0 to $2.50 average SMSA wage rate.

2/ Family head employment is full-time.

3/ FILOW is family income less the youth's own wage and salary income.

4/ Same as in footnote 1, except participation rates are predictions for youths in families with 0 to $3,000 FILOW. We do not include Negro participation by FILOW categories since no race-employment status of family head-FILOW interaction terms were used. Using the information provided in regressions G-4 and G-8, one would predict that Negro and white participation differs by the same amount in moving up the FILOW categories for any given school, employment status of family head group.

the expected sign. Large distinctions in added worker effects by income groups occurred only between the 0 to $3,000 category and higher categories. We observed no tendency for the head's employment status to influence participation of youths from middle income families.

The only empirical support for the hypothesis (8) that added worker effects are very large among youths from Negro and poverty tract families is the results for Negro students. Negro students displayed a large though barely not statistically significant response to the family head's unemployment while the effect on white students was small and not significant. The differences by race in student added worker effects were extremely high in cases where the family head was unemployed over 11 weeks. 47/ In the case of nonstudents, added worker effects were not statistically significant for whites, Negroes, or residents within or outside poverty tracts. 48/

General effects on students and nonstudents were not statistically significant. Tests using differences in weeks unemployed or differences in employment status both yielded the same result. The only pieces of evidence for the hypothesis (9) that added worker effects are larger among nonstudents than among students are the effects on the low income group. In table 31, we note in the 0 to $3,000 category the much larger participation differences among white nonstudents than among white students. Furthermore, the added worker effect reported for low income white students were not statistically significant although the coefficients displayed the expected sign. Thus, hypothesis (9) holds only for whites in the lowest income category.

In a result inconsistent with hypothesis (10), the size of added worker effects did not increase with the number of weeks of unemployment endured by the family head. Students and nonstudents with family heads unemployed for 1 to 4, 5 to 10, or 11 weeks did not participate

47/ See table G-2.
48/ See tables G-5 and G-6.

at significantly higher rates than their counterparts in families with an employed family head. Hypothesis (10) did appear valid for Negro students. Negro students with family heads unemployed over 11 weeks had predicted participation rates of 25 to 50 percent higher than other Negro students.

Income Effects

Hypotheses. The widely held view that income effects are negative follows from the presumption that income is a superior good. A pure income effect to an individual results from changes in his unearned income. To a member of a family, changes in total family income exclusive of the member's own earnings may or may not be a pure income effect. If the change results from unearned income, it is a pure income effect. Changes in another member's wage rate may have, as shown in the family utility model in chapter III, both an income effect component and a cross substitution effect component. The assumptions necessary to make the effect of total family income less the youth's own earnings (FILOW) a pure income effect are 1) that the leisure of each family member is independent of the leisure of other family members, and 2) that the youth gains satisfaction from any rise in family income regardless of its origin.

Using these assumptions adds a negative bias to the measure income effect. If an adult member's wage increases, the rise in FILOW reduces work effort by a youth member due to the rise in family income. Without the simplifying assumption, part of the observed decline in youth participation results from the decline in the youth wage rate relative to the adult's wage rate. This component is the cross substitution effect. Thus, calling the entire decline in youth participation an income effect exaggerates the actual pure income effect unless the leisure of each family member is independent of other family members.

Another limitation of FILOW is that it fails to take account of

differences in family size. An income per capita measure offers only a partial solution to this problem since there may be economies of scale in family size. We do use the number of family members as an explicit variable in a few regressions. A third factor considered only indirectly in the empirical tests is the relative income effect.

Hypothesis (11): FILOW exerts a larger negative effect on students than on nonstudents.

Most male nonstudents have no good alternative to participation regardless of income. Opportunity costs are low for male nonstudents and may decline with income. Few desire full-time leisure over a combination of work and leisure. For students, the labor force decision involves the allocation of only off-school hours; it is a choice between part-time work and part-time leisure except during vacations. It appears plausible that family income would play a large role in this choice.

School-work linkages are relevant here as in the case of discouraged and added worker effects. Because income affects the school attendance as well as the labor force decision, we may observe stronger income effects on nonstudents than on students. Low income induces many young men and women to leave or not to continue school in order to work. This effect of low income reduces the number of labor force oriented students and increases the number of labor force oriented nonstudents. In other words, many of those students influenced by low family income to enter the labor force become nonstudents.

Hypothesis (12): High FILOW reduces participation of Negro youths more than participation of white youths.

This hypothesis follows from the impact of relative income. Negro families are, in general, a good deal poorer than white families. If families of each race think of their income not only in absolute terms but also in comparison to other families of their race, a $3,000 to $6,000 income would appear larger to a Negro family than to a white

family. Having more contact with families in the under $3,000 range, a Negro family with a $6,000 to $10,000 income may feel wealthier than a white family in the same income class. If this relative income feature is important, we should observe larger declines in participation rates with higher family incomes among Negro youths than among white youths.

A permanent income formulation argues for a different conclusion. Suppose that Negro and white youths base their participation decision on their family's permanent income. Since there is a higher component of transitory income in Negro than in white families, medium and high income Negro families have lower permanent incomes than white families in the same current income categories. Thus, the observed, mostly transitory differences in Negro family incomes would produce smaller youth participation differences than do the observed, mostly permanent differences in white family incomes.

Hypothesis (13): FILOW exerts a more significant impact on hours supplied than on March participation.

March participation is a dichotomous concept, measuring only whether individuals are or are not members of the labor force. In order to affect March participation, a variable must move at least some youths from nonparticipation into the labor force or vice versa. It is not enough that a variable make the labor force decision an easier or more difficult one. Suppose at one value of a variable many youths are certain they do not want to participate. At another value comparable youths almost enter the labor force but remain nonparticipants. The variable does influence the decision but its influence is not large enough to affect March participation. As long as those youth participants affected by FILOW remain in the labor force and those youth nonparticipants affected by FILOW remain out of the labor force, FILOW will exert no effect on March participation.

With the use of hours supplied, we do measure any effects of FILOW on those youth who remain in the labor force. Youths do not have to

leave or enter the labor force as a result of income differences. The hours supplied measure catches changes in the degree of participation.

Income Effects: Results. The measured effects of income varied by regression and by subgroup. Coefficients for different income levels were unstable; their impact changed as the variables included in the regression changed. These differences occurred in cases where the samples were comparable. Nevertheless, certain broad trends in the results are discernible.

The results for students and nonstudents are particularly uneven. First, we consider participation in March 1967. Negative income effects are generally more important among students than among nonstudents but, in some regressions, income effects were not statistically significant for either school activity group. For example, table 32 indicates that students from families in high income ranges participated at rates from 3 to 6 percent lower than students from families in the low income range. Income failed to exert a significant effect on nonstudents. This sample covered all youths regardless of family status in or out of large SMSA's. The regression did hold marital status and family size constant. In other regressions using only the sample of youth in 96 of the largest 104 SMSA's, student participation again responded negatively to rises in FILOW and nonstudent participation did not.

A third set of regressions used only children or other relatives of the family head in 96 of the largest 104 SMSA's. Wives, family heads, and unrelated individuals were excluded. This set also differed from the other regressions since it included employment status of the family head as an independent variable. In these results, income effects were not statistically significant for students or nonstudents. Nevertheless, the pattern showed larger coefficients and t values among students than among nonstudents. 49/

49/ See tables G-3 and G-7.

Table 32. Income effects by school activity status: March 1967

| FILOW | Students 1/ | | Nonstudents 2/ | |
|---|---|---|---|---|
| | B coefficient | T value 3/ | B coefficient | T value 3/ |
| 0 to $ 2,999..... | --- | --- | --- | --- |
| $ 3,000 to $ 4,999..... | -.0306 | - 1.6 | -.0022 | - .1 |
| $ 5,000 to $ 6,999..... | -.0383 | - 2.0 | -.0030 | - .2 |
| $ 7,000 to $ 9,999..... | -.0496 | - 2.8 | -.0162 | - 1.0 |
| $10,000 to $14,999..... | -.0454 | - 2.5 | .0219 | 1.2 |
| $15,000 and over..... | -.0643 | - 3.2 | .0010 | 0.0 |

1/ These results are taken from table G-9.

2/ These results are taken from table G-10.

3/ See footnote 3 in table 27.

Thus, the evidence for March participation is consistent with the hypothesis (11) that FILOW exerts a stronger impact on students than on nonstudents. However, income effects were not statistically significant for students or nonstudents when we hold employment status of the family head constant.

The pattern of income effects by race followed that described by hypothesis (12). The decline in participation rates and in hours supplied between low and middle income groups was much larger for Negro than for white youths. These results, noted in table 34, are consistent with the relative income hypothesis. Middle income Negro families, feeling wealthier than middle income white families, acted in terms of youth participation as if they were wealthier than their white counterparts. It is interesting that this tendency did not extend to the highest income groups. One explanation is that Negro families at these levels no longer used other Negro families as their reference group for income comparisons. Another is that Negro families attaining this level of income are exceptional in terms of motivation and ability. A third possibility is simply that actual incomes of Negro families in this wide range are lower than those of white families in this range. And by acting no differently than whites with higher average incomes, their behavior followed the pattern of middle income groups. Finally, the incomes of Negro families in this range may contain a particularly high transitory component.

The income effect results noted in table 34 provide strong support for hypothesis (13). Income differences did not result in March participation differences for all youths in the largest SMSA's. Using almost the same youth sample in hours supplied regressions, we found that high income reduced labor supply by a substantial amount.

Table 33. Income Effects on Youth Participation by Race: March 1967 Participation and Hours Supplied in 1966

| Category | March participation (in percent) 1/ | |
|---|---|---|
| | Negroes | Whites |
| FILOW: 2/ | | |
| 0 to $ 2,999..... | 80.6 | 81.9 |
| $ 3,000 to $ 5,999..... | 74.8 | 80.6 |
| $ 6,000 to $ 9,999..... | 75.7 | 81.8 |
| $10,000 and over..... | 83.6 | 84.9 |
| | Hours supplied (in hours) 3/ | |
| | Negroes | Whites |
| FILOW: 2/, 4/ | | |
| 0 to $ 2,999..... | 932 | 821 |
| $ 3,000 to $ 5,999..... | 801 | 827 |
| $ 6,000 to $ 9,999..... | 697 | 727 |
| $10,000 to $14,999..... | 785 | 697 |
| $15,000 and over..... | 807 | 706 |

Note: The labor force participation rates and hours supplied reported above are predicted rates and hours for the specific youth subgroups listed in the footnotes below. However, the differences in rates and in hours supplied by race and by FILOW also apply to groups with other individual characteristics and groups facing other area labor market conditions.

1/ These results are taken from table G-12. The rates are predictions for 18 to 19 males, not in school, not high school graduates, not family heads, living in SMSA's with 0 to 2.5 percent unemployment rates and 72 to 89 percent range of relative opportunities.

2/ FILOW is family income less own wage income.

3/ These results are taken from table G-19. The hours are predictions for 18 to 19 youths, not wives or family heads, not high school graduates, low skilled, living in SMSA's with 0 to 2.5 percent unemployment rates and 0 to $2.50 average wage rates.

4/ The $15,000 and over category uses the additivity assumption with respect to race and FILOW effects since no Negro-$15,000-and-over interaction term appeared in the regression.

Table 34. Income Effects on Youth Participation: March Participation and Hours Supplied in 1966

| FILOW category | March participation 1/ | |
|---|---|---|
| | B coefficient | T value 2/ |
| FILOW: 3/ | | |
| 0 to $ 2,999..... | --- | --- |
| $ 3,000 to $ 5,999..... | -.027 | - 1.3 |
| $ 6,000 to $ 9,999..... | -.008 | - 0.4 |
| $10,000 and over..... | .019 | 1.0 |
| | Hours supplied in 1966 4/ | |
| | B coefficient | T value |
| FILOW: | | |
| 0 to $ 2,999..... | --- | --- |
| $ 3,000 to $ 5,999..... | - 22.1 | - .6 |
| $ 6,000 to $ 9,999..... | -121.7 | - 3.5 |
| $10,000 to $14,999..... | -238.4 | - 6.6 |
| $15,000 and over..... | -334.2 | - 8.6 |

1/ These results are taken from table G-11.

2/ See footnote 3 in table 27.

3/ FILOW is family income less own wage income.

4/ These results are taken from table G-18.

Discouraged and Added Worker Hypotheses: Gross Effects

A major advantage of the CPS micro data is that they allow simultaneous tests of individual, family, and area effects. This advantage is especially important with respect to estimates of the discouraged and added worker effects. Other studies estimating discouragement effects cross sectionally have used areas as observations, a procedure which does not net out added worker effects. Added worker estimates using data on individuals have not controlled for area labor market conditions. A number of regressions in this chapter include a variable for area employment conditions and a variable for the employment status of the family head. Thus, this chapter reports net estimates of discouragement and added worker effects.

Since an extensive literature has examined the combined impact of discouraged and added worker effects on all youths, we did not focus on this aspect of youth labor supply. Nevertheless, the interest in gross effects justifies some discussion of them in this chapter.

The general conclusion is that added worker effects reduce the total impact of differing labor market conditions to only a small extent. For the few groups in which the added worker effects are important, the head's employment status does exert a large impact on labor force participation rates. According to our regressions, the probability that a Negro student or a low income nonstudent participates increases with the unemployment of his family head as well as with increases in SMSA employment opportunities. For other subsets, however, employment status of the family head did not play a significant role in participation. Thus, the net discouragement effects also represent gross effects of discouraged and added worker effects for most groups.

The total impact of added worker effects is minor not only because the effects are important only for a few subgroups but also because even wide differences in SMSA employment conditions cause relatively small differences in the percentage of family heads unemployed. SMSA

differences in employment conditions may cause unemployment of family heads to differ by as much as 5 to 6 percent. Still, the differences in employment conditions do not affect the family heads of 90 percent of Negro student and low income nonstudents.

Moving from an area with good to an area with poor employment conditions reduces participation of Negro students and low income nonstudents whose heads continue as employed and raises participation of those whose heads become unemployed. The gross effect on participation of the two groups as a whole is one of discouragement.

Other Results

All interesting results do not fit neatly into groups of major hypotheses. In a set of regressions utilizing a great number of variables and interactions between variables, it is not at all surprising to find a few of these results.

Marital Status. The first of these that we note involves the marital status variable. In their role as primary earners in the family, married men have higher participation rates than single men for all age groups (Waldman). The regression results are consistent with this fact for youth in general. We also tested the effect of marital status on participation for youth separated by school activity status. In order that the marital status variable not include the offsetting influence of decreased participation among married women, a sex-marital status interaction was used. We also examined possible differential marriage effects by race with a marital status-race interaction term.

It is somewhat surprising to find in table 35 that marital status seems to have little or no effect on the participation of male students or nonstudents, taken separately. It does not follow that marital status has no effect on male youth participation. Nonstudents participate in the labor force to a much larger extent than do students. Since marital status exerts a strong negative influence on school activity,

Table 35. Marital status effects by school activity, race, and sex (in percent)

| Sex and race | March 1967 participation | | | |
|---|---|---|---|---|
| | Students 1/ | | Nonstudents 1/ | |
| | Single | Married | Single | Married |
| White males..... | 39.8 | 39.0 | 91.4 | 95.1 |
| White females 2/..... | 28.9 | 22.8 | 82.2 | 36.9 |
| Negro males 2/..... | 38.6 | 34.8 | 87.2 | 98.6 |

1/ These results are taken from table G-9 and G-10, respectively. Participation rates are predictions for youths, 18 to 19 in families with 4 to 6 members and FILOW of 0 to $2,999, residing outside farm and poverty tract areas, and with more than 8 years of educational attainment.

2/ The female-marriage and Negro-marriage interaction terms were not statistically significant in the regression on student participation.

the total marriage effect on male youth participation is positive. Because of the simultaneous nature of the youth allocation of time decision, one cannot say that marriage affects his school activity decision but not his participation decision.

Married young women tend to participate less than single young women regardless of school status. For youth, the housework alternative is probably much less important for single women than for married women. As a result, single nonstudents lose more by not participating in terms of market earnings plus imputed earnings from housework than married nonstudents do. This differential is probably not as large for students since only off-school hours are involved. The results follow this line of reasoning. The negative effect of marriage on labor force participation is substantial and highly significant among nonstudents. For students, we find only a small effect that is not statistically significant.

Marriage for male nonstudents has a larger positive impact on Negroes than on whites. Apparently, the limited job opportunities available to male Negro youths are not enough to reduce participation of those Negroes that have heavy family responsibilities.

Farm Residence. Charles Silberman argues that the 1930-60 decline of 900,000 teenage jobs in agriculture has had important impact on the high teenage unemployment rates of recent years. The movement from the family farm to the competitive sector makes the job search difficult, which, in turn, may discourage youth from participating in the labor force (Silberman). One would expect, then, that farm residence has a positive effect on youth participation. This positive effect should be larger for students than nonstudents since jobs performed by family farm workers may be particularly adaptable to a student's schedule.

We do find that farm residence increases participation of school youth more than that of non-school youth. In fact, the effect on

non-school youth participation of farm residence was, contrary to expectations, negative and statistically significant. The reason for this latter result is not clear. It appears to be inconsistent with the Silberman hypothesis that job search difficulties increase as youths move off the farm. One possible explanation is that the kind of jobs that nonstudents seek, full-time jobs with adequate pay, are declining in the farm areas.

Explanatory Power of Labor Supply Regressions

The performances of the labor supply regressions varied widely in terms of total explanatory power. Some regressions explained only a small amount of the variance in the dependent variable while a few accounted for about one-third of the variance. The $R^2$ statistics associated with each regression appear in appendix G.

The regressions on students and those on nonstudents which included only children living with their family head displayed $R^2$ of .04 and .09, respectively. Apparently forces other than age, sex, race, SMSA employment conditions, residence in or out of a poverty tract, employment status of the family head, and family income accounted for virtually all of the individual variation in labor force participation within these groups. One may speculate that individual differences in ability and motivation are two major factors in youth participation not reflected by the included independent variables.

A comparison of the different regression performances yields other conclusions. First, explained variance was higher in regressions on nonstudents than in those on students. That is, the socioeconomic variables included in the regressions accounted for a greater share of the variation in nonstudent than in student participation. Second, the addition of young family heads and young wives to the student and nonstudent samples significantly improved the overall performances of the regressions. The $R^2$ statistics were .19 and .34 for students and

nonstudents as a whole as compared to .04 and .09 for the narrower sample that excluded wives and family heads. Limiting the sample to one family status subgroup may reduce the total variance. But much of the variance removed is that which can be explained by family variables. Thus, dividing the sample into homogeneous subgroups may increase the difficulty in explaining a high percent of the variance. A second interpretation is that the other included variables do a better job in accounting for labor supply variations among wives and family heads than among children.

Another general aspect of the regression results is that adding interaction terms usually did very little to raise the $R^2$. However, interaction terms did improve the fit substantially for the sample of all youths in the largest 96 SMSA's. By taking into account the different labor force responses of family heads and nonheads and of students and nonstudents to family income and employment conditions variables, interaction terms increased the $R^2$ from .14 to .21.

Summary of Labor Supply Findings

These findings are summarized by answering two sets of questions. The first cover the sensitivity of youth labor supply to wage and employment opportunities. The second concern the impact of family income on youth participation.

1. How large is the influence of SMSA differences in employment conditions on the youth labor supply? On student and on nonstudent participation?

SMSA employment conditions exerted a substantial impact on the youth labor supply. This influence varied widely depending on the SMSA variable, the youth subgroup, and the labor supply concept used. Looking at the effects on students and on nonstudents in March 1967, we continue to find a wide range of effects. We observe a rise in participation probabilities of about 23 percentage points for students

and about 13 percent for nonstudents in moving from SMSA's with the poorest employment opportunities to those with the best employment opportunities. These are the combined effects of the relative opportunities, employment change, and unemployment rate variables. Of these, SMSA differences in youth employment opportunities relative to those of adults produced the largest effects--12 to 17 percent--on both nonstudents and students.

Nonlinearities appeared in the effects of the general labor market variables. Employment change and the unemployment rate did not significantly influence youth participation within the good to medium range of SMSA employment conditions but exerted large effects between areas with poor and areas with medium and good employment conditions. Students in areas with very low employment change participated about 10 to 12 percent less than students in other areas. Predicted participation rates of nonstudents in high unemployment rate areas were about 7 percent lower than those of other nonstudents.

Thus, we found the sizes of discouragement effects on students and nonstudents, the importance of various labor market measures, and the ranges over which these measures influence participation.

2. Do employment conditions influence the full year concepts of labor supply?

We found that the SMSA unemployment rate exerted a sizeable influence on the full year concept but little influence on the other. High SMSA unemployment rates appeared to reduce the number of youths who spent any time in the labor force during 1966. However, the impact of high SMSA unemployment rates on hours supplied by those who did participate was minor. Still SMSA labor market conditions affect the total amount of labor supplied in a year and not simply the timing of participation.

3. In what ways do discouragement effects vary by race, by residence in or out of a poverty tract, or by education?

The terms associated with disadvantaged youth groups had negative effects on youth participation. The effect of the Negro term was a negative 8 to 10 percent; of the poverty tract term, a negative 4 to 5 percent; of the high school graduate term, a positive 4 to 7 percent. These effects probably reflect in large part the fact that disadvantaged groups become discouraged from participating by the generally higher unemployment rates they face.

Discouragement effects as measured by labor force responses to SMSA employment conditions did not vary by race or by residence in or out of a poverty tract but they did vary by education. High school graduates displayed lower labor force responses to SMSA labor market conditions than did nongraduates. Thus, only one of three disadvantaged groups showed greater discouragement with respect to SMSA conditions while all three participated at lower than average rates.

The second set of questions deals with the relation between family income and the youth labor supply.

4. Does family income (FILOW) exert a strong influence on youth participation in March 1967?

5. Do income effects vary by race and by school activity status?

6. Does FILOW have an impact on hours supplied in 1966?

In general, family income did not significantly affect youth participation in March 1967. However, participation of some youth subgroups did decline with increases in income. The income variable produced negative effects on student participation of 3 to 6 percent but the negative effects were not statistically significant when the family head's employment status was included. All income effects on nonstudents were not statistically significant. Participation of Negro

youths in the $6,000 to $10,000 FILOW range was 6 to 7 percent lower than that of Negro youths in the 0 to $3,000 range although further increases in Negro family income appeared to increase youth participation.

Although family income exerted little influence on the March 1967 participation of youths, another youth labor supply measure--hours supplied in 1966--was very responsive to income differences. Comparing youths from families with 0 to $3,000 FILOW with youths from families with $15,000 and over, we find a negative effect on hours supplied of over 300 hours. The negative income effects in hours supplied were large and statistically significant for both white and Negro youths and occurred throughout the FILOW range.

## Chapter VI. Summary

The preceding chapters have reviewed some of the labor force participation literature, noted methodological and empirical differences between this study and others, presented a theoretical model for statistical testing, and reported and interpreted the empirical results on the labor supply of adult men, adult women, and youth.

As described in chapter I, major innovations of this study are the simultaneous estimation of individual, family, and area effects on labor supply, the use of a continuous measure of labor supply, and the examination of labor force behavior by detailed subgroups. In addition, the results differ from those of earlier cross section studies because of the period of time involved. This study analyzes labor force behavior in a recent, high employment period, 1966-67, while other investigations have studied participation in earlier, poor employment years.

The initial separation of the analysis into adult men, adult women, and youth was based on the notion that substantially different forces were at work in determining labor supply for each subgroup and that the responses to common variables differed by subgroup. This chapter ties together major results of earlier chapters by comparing differences and similarities in labor force behavior among these groups. The latter sections point out some policy implications of the results and discuss the use of the labor supply model for projections.

### Wage Effects and the Discouraged Worker Hypothesis

The labor supply responses to wage rates and to area employment conditions are related. If participation is based on expected wage rates, it is a function of the relevant market wage rate for an individual and his probability of employment. Attempts to estimate wage effects were made in the case of adult men and adult women. Difficulties in finding a job can result from individual disadvantages or poor area conditions. These difficulties discourage participation. Discouraged worker effects pertained here only to

effects of SMSA employment differences on participation. However, specific individual attributes also effect labor supply partly by influencing expected wages. These individual factors are discussed later in the chapter.

The variables used in measuring wage effects were the actual wage earned by adult men and an occupational index representing wage differences among adult women. The effect of each variable on hours supplied in 1966 provides imperfect estimates of the labor supply responses of adult men and women to wage differences. The occupational index leads to upward biases in measured wage effects since the index picks up factors other than wages, such as motivation and job satisfaction, that increase one's desire to participate and one's chance for employment at any given wage rate. In the case of adult men, an attempt was made to separate the wage effect into a substitution effect and an income effect.

Adult men displayed a negative supply response to wage differences. In a regression on hours supplied by adult men which held constant age, race, marital status, education, residence in or out of poverty tract, self-employment status, and FILOW (family income less own wages) wage rates exerted a statistically significant negative effect on labor supply. The substitution effects of economic theory calculated appeared with the wrong sign in most cases. The most plausible explanations for the wrong sign have to do with the assumption of the family utility function. All family unearned income and wives earnings is lumped together in one variable called FILOW. In reality, there may be a number of income effects.

Adult women increased their hours supplied in response to wage differences reflected by the occupation index. Although the extent of the positive bias on these estimates is not known, it does appear that adult women respond more positively to higher wage rates than do adult men. An explanation of this phenomena may follow from the theoretical consideration that men substitute market work for leisure while women increase market work at the expense of leisure and house work. If the wage rate for an adult woman rises, a substantial part of the increased level of market work

occur through reducing house work hours. Since the income effect aspect of the wage increase is probably less important to the market work versus house work trade-off than to the market work versus leisure trade-off, the substitution effects of wages on market hours supplied dominates for adult women as Mincer (1962) argued.

The effects of SMSA employment conditions on labor supply varied a good deal by subgroup. One general finding is that unfavorable SMSA employment opportunities reduced labor force participation significantly for secondary workers. However, variations occurred within major groups, with different labor market variables, and with different labor supply concepts. A few highlights are discussed below.

First, the labor force responses to differences in SMSA unemployment rates were generally nonlinear. Women who lived in areas with unemployment rates in the medium range, had significantly lower participation than women living in low unemployment areas. But there was little differences in participation between medium and high unemployment rate areas. On the other hand, youths, and men over 55, participated substantially less only in SMSA's with the poorest employment conditions. Little participation response to SMSA differences occurred within the range of good to medium area employment opportunities. A speculation is that the labor supply of adult women responds only to the recruiting efforts that occur in the tightest labor markets while youths and men over 55 continue in the labor force until local employment conditions are very poor.

Second, racial differences in the labor supply response to SMSA conditions did not occur for youths.

Third, labor force responses of subgroups varied with the SMSA labor market variable used. One interesting variation involves student and non-student youths. Nonstudent participation decreased in response to high SMSA unemployment rates while student participation did not. In contrast, high SMSA employment change encouraged participation among students but

not among nonstudents. It appears that the unemployment rate affects both youth activity and participation. Employment change influences only the participation of students.

Income Effects and the Additional Worker Hypothesis

The effect of other family income on participation is closely related to the additional worker hypothesis. Just as a family member is expected to increase his work effort in response to a decline in family income, the unemployment of the family head, which is a decrease in present and expected family income, is expected to induce labor force entrance on the part of other family members.

The tests of income effects and the additional worker hypothesis in this study are more appropriate to the concepts than previous tests. An individual worker's family income less his wage and salary income (FILOW) was used to explain that individual's participation. Income and additional worker effects were measured net of area and other individual effects. 50/

High FILOW exerted a negative effect on participation for all major subgroups. The negative effect on adult men and adult women was much larger for single than for married individuals. Participation was almost 24 percentage points lower for women with FILOW of more than $7,500 than those with FILOW less than $1,500. The comparable effects were 17 percentage points for single prime-age men and 5 percentage points for married prime-age men. Income effects on youth participation in March 1967 were negative but relatively weak. High FILOW did substantially reduce hours supplied by youths in 1966. For both March and hours supplied concepts, young Negroes decreased their participation more than young whites did as FILOW moved from low to middle categories. This finding is consistent with relative income hypothesis in that the middle income Negro may feel richer than a middle income white

50/ The importance of this feature can be seen by noting the bias involved in a test of the additional worker hypothesis with no controls on race. Spurious negative correlation would result from the fact that Negro family heads are subject to higher unemployment than whites and Negro youths have a higher degree of discouragement than white youths due to lack of jobs in their neighborhoods.

because of the higher relative position attained within his community. Most earlier studies did not find a negative income effect on youth participation because of the lack of proper controls on other variables.

Tests also confirmed the additional worker hypothesis for both women and low income nonstudents. Women with unemployed family heads participated 7 to 8 percentage points more than other women. Youths with $0 to $3,000 FILOW raised their participation by 28 percentage points in response to the family head's unemployment. This latter result is evidence for Mincer's hypothesis that the added worker effect, serving as a substitute for capital decumulation, is especially prevalent among low income families. However, in the case of women, when both FILOW and husband's unemployment rate variable is included in the regression, the additional worker effect becomes insignificant.

The detailed analysis of family status and the interactions of family status with other variables brought to light some interesting points: The youngest child's age had a strong effect on the participation of married women; Negro married women reduced their participation less when young children were present than white married women; and married college graduates reduced their participation more in the presence of young children than less educated married women. However, there was no surprise in the more general results that participation is higher for family heads than for wives and children, higher for single than for married women, higher for married than for single men, higher for women without children than for those with children.

Although married prime-age men had a participation rate a few percentage points above prime-age single men, ceteris paribus, a much lower income effect was found for married than for single men. For youth, marriage had a surprisingly small effect on participation when school activity status and sex was controlled. A substantial negative effect on participation from marriage did occur in the case of young out-of-school women. Thus, marriage and the presence of young children do

exert strong negative effects on the participation of women, although the effects are weaker for Negro women than for others and stronger for college graduates than for other women. Marriage has little effect on the participation of young in-school women and men whose FILOW is low. There is a substantial positive effect of marriage on March 1967, participation of adult men whose FILOW is high and on hours supplied in 1966 of all adult men.

Age

Age is a proxy used by many employers to reflect variations in future working lives and in the abilities of workers. Since participation behavior of prime-age men is believed to differ substantially from older men, age is the major subdivision in the section on adult men. It is hardly new to note that older men and women supply less labor than prime-age workers, partly as a result of declines in expected return and in labor force commitment. Some of the detailed results are of interest.

Old-age narrowed the difference in participation in March 1967, between highly educated and other adult women. This result is mildly surprising in that a reason often cited for poor employment opportunities of the aged is outdated skills. One would expect lower incidence of outdated skills among the well-educated. For reasons of tastes and physical requirements, well-educated adults are less likely to reduce their participation with age. Widening of the education differential does occur with age in the hours supplied regressions. For adult men, the effect of age is less for those with more education. A narrowing of the participation differential by marital status does take place with age for both adult men and women. Participation of adult women with no husband present declines faster with age than participation of married women.

The labor force response to differences in income is greater for older than for younger men. Older men reduce their participation as

income increases to a much greater extent than prime-age men do. Participation of older men is also more responsive to differences in employment conditions. This result is the expected one if, as for other less desired workers, employment opportunities of older men are more sensitive to area labor market tightness than are those of prime-age men.

Older, out-of-school youths supplied more hours than younger out-of-school youth in March 1967. However, this effect does not hold for in-school youth. Relative to participation of 16-17 year-old students, there is a slightly larger amount of participation among students age 18-19, but a slightly smaller amount among 20-to-21 year-old students. This uneven relationship is a result of slightly higher participation for high school than for college youths.

Race and Poverty Tract Residence

Poor employment opportunities for Negroes and others and poverty tract residents lower their expected return to participation. As a result, poverty tract residence appears to discourage participation for both youth and adult men. 51/ However, the effect of the Negro variable is mixed. Most of the negative effect on participation of Negro youth and some of the negative effect on hours supplied by adult men can be attributed to discouragement effects. Relative income effects also seem to play a role. For March 1967, the Negro variable has no discernible effect on the participation of adult men and a positive effect on the participation of adult women. Apparently the compensating factor to the low expected returns among Negroes and others is the high level of labor force commitment, especially for Negro women. Labor force sensitivity to SMSA differences is larger for Negro than for white women but does not vary by race or by residence in or out of a poverty tract.

51/ The variable was found to have a very small effect in the regressions for adult women. In the regressions involving youth, only Negroes and whites were included.

Educational Attainment

High educational attainment contributes to high expected returns from participation and to the ability to find enjoyable work. In addition, the completion of many years of school by some individuals is an indication of a high degree of motivation on their part. The well known result of these factors is that participation rates increase with years of schooling completed. This study provides added detail and refinement to this conclusion.

The educational-attainment-participation relationship for adult women turned out to be approximately linear. Participation in March 1967, of adult women increased by about 0.5 percentage points for each rise in school level. 52/ Although this increase in March 1967 participation is much larger than the comparable result for adult men, increases in hours supplied attributed to educational attainment were larger for adult men than adult women.

In the case of adult women, a narrowing of differences in participation by educational attainment occurred with age for the March 1967 concept while a widening occurred for the hours supplied concept. Participation of college educated women decreases substantially more with the presence of young children than does participation of women with little education.

The educational attainment variable used for youths was based simply on high school graduation. As expected, youths who graduated from high school participated more than nongraduates, even with controls on age. One interesting test performed on youths and adult men, examined the relationship between educational attainment and labor force sensitivity. In the case of youths and older men, the labor force sensitivity or discouragement effects were weaker for those with high than those with low educational attainment. No substantial difference was found for prime-age men. The general conclusion that

52/ The levels were 0-4, 5-8, 9-11, 12-15, and 16 years and over of school completed.

follows from this and other tests of differential labor force sensitivity is that employment and, in turn, labor force participation of highly desired workers, are less sensitive to differences in SMSA employment conditions than are employment and participation of less desired workers.

Policy Implications

This study was designed to examine broad issues involving labor supply. The results are intended to serve as a guide to the effect of various variables on different measures of labor supply. Thus, if one could deduce how a change in policy would affect the variables in the study and if the parameters of the model remained constant, one could use the model to test the effects of various manpower policies of labor supply. These are rather big "ifs" given our concern with precise quantitative predictions. But if our concern is for qualitative or approximate measures, they are not big "ifs."

One major issue involves the differences in discouragement effects that are based on the desirability of workers. Our general conclusion that low quality workers have high labor force sensitivity to SMSA employment opportunities implies that hidden unemployment increases as we move from the most to the least desired workers. This conclusion strengthens the case for changing the present system of unemployment insurance. The rationale for unemployment insurance is to protect workers against the high loss of income occurring as the result of involuntary unemployment. Yet the lowest quality workers whose employment is most sensitive to aggregate demand changes are least able to qualify for aid. Studies on the structure of employment and unemployment changes are sufficient to make this point. This study reinforces the argument by showing that the analysis of unemployment rates underestimates the real unemployment sensitivity of low quality workers to demand changes.

Another implication that results from the greater amount of hidden unemployment among less desired workers and the higher labor force sensitivity found in this study than in time series studies involves the design and evaluation of manpower programs. Programs designed to decrease the unemployment rates of disadvantaged groups must provide jobs for those who enter the labor force when employment in their subgroup increases, as well as for those now recorded as unemployed. Plans that do not consider the hidden unemployed will underestimate their task most for the most disadvantaged labor force groups. In terms of evaluation, programs that do not reduce recorded unemployment rates may have been highly successful. The important reduction is in the amount of recorded unemployment plus hidden unemployment.

Our finding of nonlinear responses to SMSA unemployment conditions are relevant to policymakers attempting to reduce unemployment rates. On the basis of this study's results, one expects that improving SMSA employment conditions elicits a variety of labor force responses by subgroup. Moving an SMSA with poor employment conditions into the medium category would raise participation rates of youths and men, 55+, but would leave participation rates of adult women constant. As unemployment opportunities in an SMSA go from the medium to the high range, adult women are attracted into the labor force at higher rates while participation rates of youths and men 55+ are virtually unaffected. These expectations help the policymaker predict what kinds of jobs are needed to employ the new labor force entrants at different levels of the unemployment rate.

For adult men, high wage rates are associated with low hours supplied. This finding must be interpreted with a great deal of caution. If relative earnings is the relevant variable for hours supplied, there may be no decline in the work week as wage rates increase over time. One conclusion that does follow is that men working at low wage rates are willing to supply at least as many and

probably more hours than those working at high wage rates. A thorough study of the relationship between total earnings, total income, and hours supplied could dispel the notion that men with low incomes are at those levels as a result of lack of effort. The widespread knowledge that an inverse relationship exists between hourly earnings and hours supplied might provide the political basis for a great many income redistributive policies. Part of the present lack of support for these programs results from the belief that hourly earnings and effort are highly positively correlated.

The Use of the Micro Model for Projections

The Bureau of Labor Statistics projects labor force participation rates by age, sex and race to 1980 (Cooper and Johnston). The present study does not make alternative projections. The BLS projections are judgmental; no explicit model is involved. These projections were made without the benefit of the micro data developed for this study. The BLS projections relied on data broken down by race, age, and sex. The projections also relied on data by sex and education and for women by race and number of children. However, it was not possible to standardize for many more variables.

The earlier BLS labor force projections relied on Census Bureau projections of population, by age, sex and race. Since the projections were made in 1965 for 1980, all of the persons 16 and over living in 1980 were already born. The errors in the mortality assumptions are probably not too great. If the age-sex-race specific participation rates could be predicted with a fair amount of accuracy, then the projections of the total labor force would also be accurate. However, it is the prediction of the age specific rate that is the most difficult part of the BLS projections. Based on a very careful study of trends in school enrollment, fertility of women, general political and social changes, unemployment and many other factors,

an estimate is made of the trend in the future labor force participation rates of each age-race-sex specific group.

Our model makes explicit the factors underlying differences in participation, but does not tell us what values these factors are going to have in the future. It may be more difficult to predict the values of the independent variables for 1980 than to predict the dependent variable. 53/

Our model could be used for several projection purposes. First, even if the accuracy of future fertility estimates or school enrollment estimates is in doubt, a quantification of the relationship between fertility and labor force participation can be extremely useful. The importance of a number of factors affecting labor force participation have been quantified. Understanding the factors affecting participation can be more useful than an actual number predicted for participation some time in the future.

Second, the quantification may even be more useful to persons desiring to make projections in local areas since it provides the factors affecting local participation rates. A number of local labor market variables are used in the model to facilitate this use.

Third, some of the cross section coefficients may be interpreted as time series coefficients. Some writers have commented about the appropriateness of using cross section coefficients as extraneous information for time series estimation. For example, Tobin, Wold, and Stone used cross section data for consumer demand time series studies.

Kuh (1959, 1963), and Kuh and Meyer discussed some differences between time series and cross section estimates and warned that they may not both reflect the same phenomena.

53/ This statement is confusing since the independent variable can only take the values of zero or one. What is meant is that we should know how many persons will have each possible set of independent variables.

Jacob Mincer compared cross section labor force participation equations with time series equations. He concluded that the cross section coefficients represent longrun influences on participation while time series regressions represented shorter-run influences. He also pointed out that in a cross section regression, if employment opportunities worsened, outward mobility to another SMSA was a response. In a U. S. time series, however, movement out of the country is not a very common response to changes in employment opportunities.

One of the difficulties of drawing temporal inferences from cross sections is that what may appear to be the same variable in both a cross section and a time series may be quite a different variable. For example, a great deal has been written about the shortrun cyclical response of the labor force to changes in overall employment opportunities. 54/ In a time series regression, the unemployment rate (or the ratio of employment to population) measures the shortrun cyclical response of the labor force to changes in employment opportunities. In a cross section regression, the unemployment rate of an SMSA is also a measure of longer-run structural characteristics of the SMSA.

Similarly in a cross section, income of a husband, ceteris paribus, is negatively associated with the wife's labor force participation, while in a time series, family income increases have been accompanied by even more rapid increases in labor force participation. 55/

The difficulty with these examples is that the specification of the time series and cross section equations is not the same. If, in a cross section regression, unemployment of the family head were included instead of unemployment of the SMSA, the specifications would be closer to the time series specification for secondary family members. If employment change in the SMSA were included in the cross section

54/ See especially Tella, Mincer, and Dernberg-Strand cited in ch. I.
55/ See also the discussion in Cain, chs. I and II.

regressions, the comparison between cross sections and times would also be closer for family heads.

Also in the case of the income variable, the response of labor supply to income may not depend on absolute income, but on relative income. If everyone's income rises, the average amount of labor supplied would not decline. However, when families with different amounts of income were compared we found a negative income effect. 56/

Because of the difficulties discussed in the previous pages, we have not attempted to use the BLS model to make projections. The model is viewed as a first step toward improving labor force projections, but we await further refinements before replacing the present procedures for projections with micro model projections.

56/ For an alternative reconciliation of the cross section and time series income effects, see Cain, ch. II.

## Appendix A. Glossary of Variables Constructed for Study

Employment Change. Percent change in SMSA employment is equal to the difference in SMSA nonagricultural payroll employment between the annual average employment change for 1967 and the annual average for 1966 divided by the average SMSA employment during 1966. February to March 1967 employment is designated separately. The data are payroll (establishment) figures compiled by the Bureau of Labor Statistics and published in Employment and Earnings.

FILOW. FILOW is the total family income less an individual's own wage and salary income in 1966 as reported in the March 1967 Current Population Survey.

High School Graduate. A high school graduate is one whose reported educational attainment is 12 or more years.

Hours Supplied Per Year

The continuous labor supply variable must be constructed rather crudely. It is based on information available on weeks unemployed, weeks worked, hours worked per week and reasons for part-time work. We have only broad intervals for the number of weeks worked and the number of weeks looking for each individual. The two are combined to give a weeks supplied index as shown in table A-1.

The average hours of labor supplied each week also had to be constructed, but in a less satisfactory fashion than the weeks in the labor force variable. The only information we have about hours worked during 1966 is whether the individual was primarily part-time or primarily full-time. Therefore, additional information is used about the individual's status during the March survey week to infer the average number of hours that he worked per week the previous year.

In table A-2 there is a summary of the estimates made of average hours per week for individual tabulated by whether full or part-time in 1966 and labor force status in 1967. The estimates reflect best guesses.

Occupational Earnings Categories for Women

Women working one or more weeks during 1966 were assigned a code based on median earnings in 1966 of their occupation of longest attachment. 1/ The coding is given in table A-6.

In or Out of the Labor Force During 1966. A person was classified as in or out of the labor force during 1966 if he was employed one or more weeks during 1966 or his main reason for no work during 1966 was that he was unable to find work.

Relative Opportunities. The relative opportunities of adult women is the 12 month average (January 1966 through December 1966) of the employment-population ratio for adult women, age 16+, divided by the employment-population ratio for both sexes, 16+. The youth relative opportunities substitutes the employment-population ratio of both sexes, age 16-21, for the numerator used above. The employment and population data are taken from the 1966 Current Population Surveys.

Unemployment Rate. The SMSA unemployment rate used in this study is the 12 month average (January 1966 through December 1966) of unemployment rates calculated from Current Population Survey data.

Wage Rate for Adult Males. The wage index used in the continuous supply equation for men required that hours worked rather than hours supplied be divided by earnings. The estimates of weekly hours worked are given in table A-3 and the weeks estimates are given in table A-4. For those working one to thirteen weeks the percentage error in the wage is too great so we used a wage derived from the occupational median income for full-time workers. (See table A-5.)

Weeks Unemployed of Family Head. The number of weeks the family head is unemployed at the time of the March 1967 Current Population Survey.

Weeks Worked of Family Head. The number of weeks worked by the family head during 1966.

1/ See Current Population Reports, Consumer Income, P-60, No. 53, p. 45.

Welfare Recipient Status. A person was classified as having a welfare recipient status during 1966 if some of his unearned income came from the income category, public assistance and miscellaneous unearned income. Unfortunately, that category includes private pensions, workmen's compensation, unemployment compensation, alimony and child support, contributions from persons not living in the household, annuities, royalties, etc., in addition to public assistance and welfare payments.

Table A-1. Weeks supplied index

| Weeks worked last year | Weeks looking or on layoff | Index |
|---|---|---|
| 1 to 13 weeks..... | None | 7 |
| | 1-4 | 10 |
| | 5-10 | 14 |
| | 11-14 | 20 |
| 14 to 26 weeks..... | None | 20 |
| | 1-4 | 22 |
| 1 to 13 weeks..... | 15-26 | 28 |
| 14 to 26 weeks..... | 5-10 | 28 |
| | 11-14 | 32 |
| 27 to 39 weeks..... | None | 33 |
| | 1-4 | 36 |
| | 5-10 | 40 |
| 14 to 26 weeks..... | 15-26 | 40 |
| 1 to 13 weeks..... | Over 26 | 43 |
| 40 to 47 weeks..... | None | 44 |
| 27 to 39 weeks..... | 11-14 | 46 |
| 40 to 47 weeks..... | 1-4 | 46 |
| 14 to 26 weeks..... | Over 26 | 49 |
| 48 to 49 weeks..... | None | 49 |
| 27 to 39 weeks..... | 15-26 | 50 |
| 40 to 47 weeks..... | 5-10 | 50 |
| | 11-14 | 50 |
| 48 to 49 weeks..... | 1-4 | 50 |
| 50 to 52 weeks..... | | 51 |

Table A-2. Estimates of average weekly hours supplied 1/

| March | Last year | |
|---|---|---|
| | Usually full time | Usually part time |
| Full time..... | March hours | 30 |
| Part time economic..... | 40 | 35 |
| Part time other: | | |
| Usually part time..... | 40 | March hours |
| Usually full time..... | 40 | 30 |
| Not at work..... | 40 | 20 |

1/ For those working 1 or more weeks.

Table A-3. Estimates of average weekly hours worked last year

| March | Last year | |
|---|---|---|
| | Usually full time | Usually part time |
| Full time..... | March hours | 25 |
| Part time..... | | |
| Usually part time..... | 35 | March hours |
| Usually full time..... | 40 | 25 |
| Not at work..... | 40 | 20 |

Table A-4. Weeks worked index

| Weeks worked last year | Weeks worked index |
|---|---|
| 14 to 26 weeks..... | 20 |
| 27 to 39 weeks..... | 33 |
| 40 to 47 weeks..... | 44 |
| 48 to 49 weeks..... | 48 |
| 50 to 52 weeks..... | 51 |

Table A-5. Wage estimates for men working 1 to 13 weeks

| Occupation | Median hourly wage 1/ |
|---|---|
| Professional, technical and kindred workers: | |
| Self-employed: | |
| Medical and other health workers | 7.28 |
| Other self-employed | 6.15 |
| Salaried: | |
| Engineers, technical | 4.99 |
| Medical and other health workers | 3.52 |
| Teachers, primary and secondary | 3.39 |
| Other salaried workers | 3.79 |
| Farm and farm managers | 1.42 |
| Managers, officials and proprietors, excluding farm: | |
| Self-employed: | |
| In retail trade | 2.45 |
| Other self-employed | 2.88 |
| Salaried | 3.79 |
| Clerical and kindred workers: | |
| Secretaries, stenographers and typists | 2.21 |
| Other clerical and kindred workers | 3.27 |
| Sales workers: | |
| In retail trade | 3.08 |
| Other sales workers | 4.15 |
| Craftsmen, foremen and kindred workers: | |
| Foremen | 4.05 |
| Craftsmen: | |
| In construction | 3.60 |
| Other craftsmen | 3.47 |
| Operatives and kindred workers: | |
| In durable goods manufacturing | 3.22 |
| In nondurable goods manufacturing | 2.86 |
| Other operatives and kindred workers | 3.00 |
| Private household workers | 1.00 |
| Service workers, excluding private household: | |
| Waiters, cooks and bartenders | 2.25 |
| Other service workers | 2.61 |
| Farm laborers and foremen | 1.29 |
| Laborers, excluding farm and mine | 2.57 |

1/ Median earnings for year-around full-time males in 1966 divided by 1,000 hours, except where average hours data indicates that longer hours were worked. From these averages, we estimated 2,250 hours per year for professional, technical and kindred workers and 2,500 for farmers and farm managers and managers, officials and proprietors. There were no data for male private household workers so we assume a wage of $1.00 per hour.

Source: U.S. Bureau of the Census, "Income of Families and Persons in the United States," Current Population Reports, Series P-60, No. 53, Washington, D.C., U.S. Government Printing Office, 1967, p. 45.

Table A-6. Occupational earnings codes for women

| | |
|---|---|
| Professional, technical and kindred workers | 5 |
| Farmers and farm managers | 2 |
| Managers, officials and proprietors, except farm: | |
| Self-employed | 2 |
| Salaried | 4 |
| Clerical and kindred workers | 4 |
| Sales workers | 3 |
| Craftsmen, foremen and kindred workers | 4 |
| Operatives and kindred workers | 3 |
| Service workers, except private household: | |
| Waiters, cooks and bartenders | 2 |
| Other service workers | 3 |
| Farm laborers and foremen | 2 |
| Private household workers | 1 |
| Laborers, except farm and mine | 2 |

## Appendix B. Glossary of Labor Force Terms

The purpose of this glossary is to define terms related to the Current Population Survey used in the micro model of the labor supply. Also included in the glossary are terms relating to variables in the model constructed from other Bureau of Labor Statistics or Bureau of the Census Surveys.

Excluded from the glossary are descriptions of data described only in appendix E, but not used in the model. Also excluded are economics, sociological, labor economics or econometrics terminology in common use in any of those fields. Finally, variables constructed for the model defined adequately in appendix A (Glossary of Variables) are not repeated in the glossary. For example, the employment change variable is described in appendix A, but the meaning of payroll employment is given in appendix B.

Age. The age classification is based on the age of the person at his last birthday as of March 1967.

Children. Data on children refer to "own" children and include sons and daughters, stepchildren, and adopted children.

Civilian Labor Force in March 1967. The civilian labor force consists of the total of all civilian persons classified as employed or unemployed according to the definitions of each (q.v.).

Civilian Noninstitutional Population. The population of individuals neither in the Armed Forces nor institutions (such as penal, homes for the aged, tuberculosis sanitariums, and so forth).

Cluster. A systematic sample of 18 contiguous households selected for possible enumeration in the Current Population Survey.

Color. The term "color" refers to the division of the population into two groups--white and Negro and others. This group includes Negroes, Indians, Japanese, and Chinese.

Composite Estimate. The last stage in the preparation of CPS estimates makes use of a composite estimate. In this procedure, a weighted average is obtained of two estimates for the current month for any particular item. The first estimate is the result of the two stages of ratio estimates (q.v.). The second estimate consists of the composite estimate for the preceding month to which has been added an estimate of the change in each item from the preceding month to the present month based upon that part of the sample which is common to the 2 months (75 percent). While the weights for the two components of such a composite estimate do not necessarily have to be equal, in this instance the weights used for combining these two estimates are each one-half. Equal weights in this case satisfy the condition that for virtually all items there will be some gain in reliability over the estimation procedure after the first two stages of ratio estimates.

This composite estimate results in a reduction in the sampling error for most important statistics from the survey beyond that achieved after the two stages of ratio estimates described above; for some items the reduction is substantial. The resultant gains in reliability are greatest in estimates of month-to-month change, although gains are also obtained for estimates of level in a given month, change from year-to-year, or change over other intervals of time.

Continuous Labor Supply Variables. See appendix A.

CPS. See Current Population Survey.

Current Population Survey. The CPS is a monthly survey conducted by the Census Bureau with a scientifically selected sample representing the non-institutional civilian population of the United States. This survey provides monthly statistics on employment, unemployment, and related subjects which are analyzed and published by the Bureau of Labor Statistics of the U.S. Department of Labor. Data from this survey are used in this study.

Earnings. These are defined as the algebraic sum of money wages or salary and net income from farm and nonfarm self-employment.

ED's. See Enumeration Districts.

Educational Attainment. Educational attainment applies only to years of school completed in "regular" schools, which include graded public, private, and parochial elementary and high schools, colleges, universities, and professional schools, whether day schools or night schools. Thus, "regular" schooling is that which could be expected to advance a person to an elementary certificate, a high school diploma, or a college, university, or professional school degree. Schooling in other than regular schools was counted only if the credits obtained were regarded as transferable to a school in the regular school system.

Employed in March 1967. Employed persons are (a) all those who, during the survey week, did any work at all as paid employees or in their own business or profession, or on their own farm, or who worked 15 hours or more as unpaid workers in an enterprise operated by a member of the family, and (b) all those who were not working but who had jobs or businesses from which they were temporarily absent because of illness, bad weather, vacation, labor-management dispute, or personal reasons, whether or not they were paid by their employers for the time off, and whether or not they were seeking other jobs.

Enumeration Districts. An administrative unit used in both the 1960 Census of Population and the Current Population Survey. The ED contains about 250 households and is selected systematically from a regionally arranged listing.

Family. The term "family" as used here refers to a group of two or more persons related by blood, marriage, or adoption, and residing together; such persons are counted as members of one family. One person in each family is designated as the "head." This person is usually regarded as the head by members of the family. Married women are not classified as heads if their husbands are living with them at the time

of the survey. A lodger and his wife who are not related to the head of the family, or a resident employee whose wife lives with him are considered a separate family. However, a married couple or parent-child group related to the head of the family and sharing his living quarters is treated not as a separate family, but as part of the head's family.

Farm and Nonfarm Residence. The farm population refers to rural residents living on farms. The nonfarm population consists of persons living in urban areas and rural persons not living on farms. The definition of farm residence used in this study is the same as that used in the 1960 census.

FILOW. Total family income less an individual's own wage and salary income. (See appendix A.)

Fulltime and Parttime Workers. In this bulletin, unless otherwise stated, fulltime workers include persons who worked 35 hours or more during the survey week, and those who worked 1 to 34 hours but usually worked fulltime. Parttime workers include persons who worked 1 to 34 hours during the survey week and usually worked only 1 to 34 hours. Persons with a job but not at work during the survey week are classified according to whether they usually worked full or parttime. However, in a discussion of work experience during a previous year, parttime workers are those who worked less than 35 hours per week in a majority of the weeks worked or an average of under 35 hours if they worked irregular hours.

Regions. The South includes Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The other States are nonSouth.

Gross Flow. These are a by-product of the Current Population Survey which shows the labor force status of persons not only in the current month, but also for the previous month. This permits the measurement of

shifts from month to month among labor force categories, industries and occupations.

Head of Family. One person in each family was designated as the head. The head of a family is usually the person regarded as the head by members of the family. Women are not classified as heads if their husbands are resident members of the family at the time of the survey. Married couples related to the head of a family are included in the head's family and are not classified as separate families.

Income. Income relates to total money income during the calendar year 1966 from the following sources: (1) wages or salaries, (2) net income from self-employment, (3) social security, or other government or private pensions, and (4) other sources, such as interest, dividends, unemployment benefits, and public assistance. The amounts represent income before deductions for personal taxes, social security, bonds, and so forth. Although income refers to receipts during the calendar year preceding the data of the survey, the characteristics of persons, such as age and marital status, relate to the date when the survey was taken.

Job Vacancies. Job vacancies are existing employment opportunities for workers outside the firm for jobs that are unoccupied and immediately available for occupancy by a new worker.

Labor Force Participation Rate. This rate is computed by dividing the civilian labor force by the civilian noninstitutional population. The rate is expressed in percent.

Longest Job. A person's longest job during the year is the one at which a person worked the greatest number of weeks. For most wage and salary workers, a job was defined as all the time worked for the same employer. The only exception was work for private families (domestic service, babysitting, odd jobs and the like) which was counted as a single job regardless of number of employers. Self-employment and

unpaid work in family-operated enterprises were also designated as jobs for purposes of this tabulation.

Major Activity Status in March-School. See school-major activity.

Major Reasons for Part-Year Work. Each part-year worker is classified by main reasons for part-year work on the basis of what he was doing most of the weeks in which he did not work. His activities are reported as unemployment, or layoff from a job, illness or disability (not including paid sick leave), taking care of home, going to school, and other. The "going to school" category was restricted to persons under 30 years of age, and "taking care of home" was restricted to women.

Man-hours Supplied. See appendix A.

Marital Status. Persons were classified into the following categories according to their marital status during March 1967: Single; married, spouse present; and other marital status. The classification "married, spouse present" is applied to husband and wife if both were reported as members of the same household even though one may have been temporarily absent on business, vacation, on a visit, in a hospital, and the like during March 1967. The term "other marital status" applies to persons who are married, spouse absent; widowed; divorced; or separated.

Nonagricultural Payroll Employment. See Payroll Employment.

Nonworker. A nonworker is a person who did no work during 1966. Each nonworker was asked whether he looked for work during 1966 and, if he looked, for how many weeks. Each nonworker is classified according to the main reason for not working. His activities are reported as illness or disability, taking care of home, going to school, inability to find work, and other.

Not in Civilian Labor Force in March 1967. All persons 16 years of age and over in the civilian noninstitutional population who are not classified as employed or unemployed are defined as not in the labor force. These persons are further classified as taking care of home or

family, in school, unable to work because of long-term physical or mental illness, and other. The "other" group includes for the most part retired persons, those reported as too old to work, the voluntarily idle, and seasonal workers for whom the survey week fell in an "off" season and who were not reported as unemployed. Persons doing only incidental unpaid family work (less than 15 hours) are also classified as not in the labor force.

Occupation, Industry, and Class of Worker. The data on occupation, industry, and class of worker refer to the job held longest during the year. Persons who held two jobs or more were reported in the job at which they worked the greatest number of weeks.

The occupation and industry categories used here are those used in the 1960 Census of Population. The composition of the major groups in terms of detailed occupations and industries is available upon request. The class-or-worker breakdown specified "wage and salary workers," "self-employed workers," and "unpaid family workers." Wage and salary workers are persons working for a wage, salary, commission, tips, payment in kind, or at piece rates for a private employer or any government unit. Self-employed workers are persons working in their own unincorporated business, profession, or trade, or operating a farm for profit or fees. Unpaid family workers are persons working without pay on a farm or in a business operated by a member of the household to whom they are related by blood or marriage.

One-in-one Thousand Sample. A .1 percent random sample from the 1960 Census of Population available to researchers.

Part-time or Full-time Jobs. See Full-time Workers.

Payroll Employment. Employment data, except those for the Federal Government, refer to persons on establishment payrolls who received pay for any part of the pay period which includes the 12th of the month. For Federal Government establishments, employment figures represent the number of persons who occupied positions on the last day of the calendar

month. Intermittent workers are counted if they performed any service during the month.

The data exclude proprietors, the self-employed, unpaid volunteer, or family workers, farm workers, and domestic workers in households. Salaried officers of corporations are included. Government employment covers only civilian employees; military personnel are excluded.

Persons on establishment payrolls who are on paid sick leave (when pay is received directly from the firm), on paid holiday or paid vacation, or who work during a part of the pay period and are unemployed or on strike during the rest of the period, are counted as employed. Not counted as employed are persons who are laid off, on leave without pay, or on strike for the entire period, or who are hired but have not reported to work during the period.

Person Family File. A computer file maintained by the Bureau of the Census which contains data from the Current Population Survey on individual and family characteristics.

Poverty Tract. Poverty areas were determined by first ranking census tracts 1/ in SMSA's of 250,000 inhabitants or more according to the relative presence (as reported in the 1960 Census) of each of five equally weighted poverty-linked characteristics, and then combining these rankings into an overall measure termed a "poverty index." The five socioeconomic characteristics used to construct this poverty index were:

1. Percent of families with money incomes under $3,000 in 1959.
2. Percent of children under 18 years old not living with both parents.
3. Percent of males 25 years old and over with less than 8 years of school completed.
4. Percent of unskilled males (laborers and service workers) in the employed civilian labor force.

1/ Census tracts are small areas into which large cities and adjacent areas have been divided for statistical purposes. The average tract has about 4,000 residents and was originally laid out with attention to achieving some uniformity of population characteristics, economic status, and living conditions.

5. Percent of housing units dilapidated or lacking some or all plumbing facilities.

Preliminary Definition of Poverty Area. After each tract had been ranked by the poverty index, those falling in the "lowest" 2/ quartile were designated as "poor" tracts.

In an attempt to approximate neighborhood concentrations of poverty, the following Poverty Area definition was developed:

1. Any area having five or more contiguous poor tracts regardless of the number of families contained within.
2. Any area of one to four contiguous poor tracts, containing an aggregate of 4,000 or more families.
3. Any area of one or two contiguous tracts not ranked in the lowest quartile that was completely surrounded by poor tracts. In some cases, areas of three or four contiguous tracts, not themselves poor but surrounded by poor tracts, were included in the neighborhood after analysis of their characteristics. Areas of five or more contiguous tracts not ranked in the lowest quartile but surrounded by poor tracts were not designated as poor tracts.

Updating for Urban Renewal. Because poverty designations were based on 1960 Census data, it was considered desirable to update these designations on the basis of information on subsequent urban renewal activities received from local renewal agencies. Any tract where 50 percent or more of the 1960 population was displaced as a result of clearance, rehabilitation, or code enforcement was then further examined on the basis of location as follows:

1. Any previously poor tract completely surrounded by poor tracts was retained as part of the Poverty Area.
2. Any previously poor tract not completely surrounded by poor tracts was excluded from the final Poverty Area designation.

2/ For the purpose of this report, tracts in the "lowest" quartile are those with the highest percentages of each characteristic and thus with the highest incidence of "poverty."

3. A "non-poor" tract originally surrounded by poor tracts which no longer remained surrounded was also deleted from the final Poverty Area designation.

See: U.S. Bureau of the Census, Technical Studies Series P-23, No. 19, August 24, 1966 for a further discussion.

Primary Families and Individuals. The term "primary family" refers to the head of a household and all other persons in the household related to the head by blood, marriage, or adoption. If nobody in the household is related to the head, then the head himself constitutes a "primary individual." A household can contain one and only one primary family or primary individual. The number of "primary" families and individuals is identical with the number of households.

Prime Age. As used in this study, ages 22 to 54.

Primary Sampling Unit. A concept used in the Current Population Survey. The entire area of the United States consisting of 3,128 counties and independent cities was divided into 1,913 primary sampling units. With some minor exceptions, a primary sampling unit (PSU) consists of a county or a number of contiguous counties. Each of the 212 standard metropolitan statistical areas (SMSA's) constituted a separate PSU. Outside SMSA's, counties normally were combined, except where the geographic area of the single county was excessive. In combining counties to form PSU's each PSU was defined so as to be a heterogeneous as possible. Greater heterogeneity could be accomplished by including more counties. However, another important consideration was to have the PSU sufficiently compact in area so that a small sample spread throughout it could be efficiently canvassed without undue travel cost. A typical primary sampling unit, for example, included both urban and rural residents of both high and low economic levels and provided, to the extent feasible, diverse occupations and industries.

PSU. See Primary Sampling Unit.

Ratio Estimates. A technique used in the CPS. The distribution of the population selected for the sample may differ somewhat, by chance, from that of the nation as a whole in such basic characteristics as age, color, sex, and farm, nonfarm residence, among other things. These particular population characteristics are closely correlated with labor force participation and other principal measurements made from the sample. Therefore, some of the sample estimates can be improved substantially when, by appropriate weighting of the original returns, the sample population is brought as closely into agreement as possible with the known distribution of the entire population with respect to these characteristics. Such weighting is accomplished through two stages of ratio estimates.

Relative Employment Opportunities. See appendix A.

School Enrollment. The school enrollment statistics are based on replies to the enumerator's inquiry as to whether the person had been enrolled at any time during the current term or school year in day or night school in any type of public, parochial, or other private school in the regular school system. Such schools include elementary schools, junior or senior high schools, and colleges or universities. Persons enrolled in special schools not in the regular school system, such as trade schools or business colleges, are not included in the enrollment figures. Persons enrolled in classes which do not require physical presence in school, such as correspondence courses or other courses of independent study and training courses given directly on the job, are not reported as enrolled in school. The data shown for all dates are comparable in the coverage of schools and colleges. This concept was not used in our study. See instead, School--Major Activity.

School--Major Activity. A person who spent most of his time during the survey week in March 1967 attending any kind of public or private school, including trade or vocational schools in which students receive no compensation in money or kind.

Secondary Individual. A secondary individual is a person, such as a lodger, guest, or resident employee, who is not related to any other person in the household or group quarters.

Size of Family. The term "size of family" refers to the number of persons who are living together and who are related to each other by blood, marriage, or adoption.

SMSA. See Standard Metropolitan Statistical Area.

Special Labor Force Report. Reports from the Monthly Labor Review containing results from supplementary surveys from the Current Population Survey.

Standard Metropolitan Statistical Area. Each Standard Metropolitan Statistical Area is an area containing:

A. One city with 50,000 inhabitants or more, or

B. Two cities having contiguous boundaries,

constituting, for general and economic purposes, a single community with a combined population of at least 50,000, the smaller of which must have a population of at least 15,000.

Stratum. A set of primary sampling units with similar characteristics. (See Current Population Survey.)

Unearned Income. The sum of all sources of money income except wages and salaries and income from self-employment.

Unemployed in March 1967. Unemployed persons comprise all persons who did not work during the survey week, made specific efforts to find a job within the past 4 weeks, and were available for work during the survey week (except for temporary illness). Also included as unemployed are those who did not work at all, were available for work, and (a) were waiting to be called back to a job from which they had been laid off, or (b) were waiting to report to a new wage or salary job within 30 days.

Unemployment Rate. The rate is computed by dividing the unemployed by the civilian labor force. The rate is expressed in percent.

Unrelated Individual. The term "unrelated individuals," as used in this report, refers to persons 14 years old and over (other than inmates of institutions) who are not living with any relatives. An unrelated individual may constitute a one-person household by himself, or he may be part of a household including one family or more or unrelated individuals, or he may reside in group quarters such as a rooming house. Thus, a widow living by herself or with one person or more not related to her, a lodger not related to the head of the household or to anyone else in the household and a servant living in an employer's household with no relatives are examples of unrelated individuals.

Wages and Salary. This is defined as the total money earnings received for work performed as an employee during the calendar year 1966. It includes wages, salary, Armed Forces pay, commissions, tips, piece-rate payments, and cash bonuses earned before deductions were made for taxes, bonds, pensions, union dues, and so on.

Weeks Worked in 1966. Persons are classified according to the number of different weeks during 1966 in which they did any civilian work for pay or profit (including paid vacations and sick leave) or worked without pay on a family-operated farm or business.

Work Experience in 1966. A person with work experience in 1966 is one who did any civilian work for pay or profit or worked without pay on a familyoperated farm or business at any time during the year, on a parttime or fulltime basis.

## Appendix C. Values of Area Variables and Area Definitions

Table C-1. Values of area variables used in regressions by SMSA of residence

| Standard metropolitan statistical area | (1) CPS unemployment rate, 1966 average | (2) Nonagricultural employment change (BLS establishment) | | (3) Relative opportunities youth, 1966 | (4) Relative opportunities women, 1966 | (5) Per capita personal income |
|---|---|---|---|---|---|---|
| | | (A) 1965-66 | (B) Feb.-March 1967 | | | |
| Akron, Ohio | ML | MH | M | M | M | M |
| Albany-Schenectady-Troy, N.Y. | ML | ML | M | M | M | H |
| Allentown-Bethlehem, Easton, Pa.-N.J. | L | L | H | M | M | M |
| Atlanta, Ga. | MH | H | M | M | M | M |
| Bakersfield, Calif. | H | MH | H | H | M | M |
| Baltimore, Maryland | ML | MH | H | M | M | M |
| Beaumont-Port Arthur-Orange, Tex. | M | MH | M | L | L | L |
| Birmingham, Ala. | ML | ML | M | L | M | L |
| Boston, Mass. | ML | MH | M | H | M | H |
| Bridgeport, Conn. | M | MH | H | L | M | H |
| Buffalo, N.Y. | MH | MH | L | M | M | M |
| Canton, Ohio | H | MH | L | M | L | M |
| Charlotte, N. C. | ML | H | H | H | H | M |
| Chattanooga, Tenn.-Ga. | ML | H | L | M | M | L |
| Chicago, Illinois | ML | MH | M | M | M | H |
| Cincinnati, Ohio-Ky.-Ind. | M | MH | H | M | M | M |
| Cleveland, Ohio | M | MH | M | M | M | H |
| Columbus, Ohio | L | MH | M | M | M | M |
| Dallas, Tex. | ML | MH | H | M | M | M |

Table C-1. Values of area variables used in regressions by SMSA of residence--Continued

| Standard metropolitan statistical area | (1) CPS unemployment rate, 1966 average | (2) Nonagricultural employment change (BLS establishment) | | (3) Relative opportunities youth, 1966 | (4) Relative opportunities women, 1966 | (5) Per capita personal income |
|---|---|---|---|---|---|---|
| | | (A) 1965-66 | (B) Feb.-March 1967 | | | |
| Davenport-Rock Island-Moline, Iowa-Ill. | L | MH | M | M | M | H |
| Dayton, Ohio | ML | MH | M | M | M | M |
| Denver, Colo | M | MH | M | M | H | M |
| Des Moines, Iowa | L | MH | M | L | M | H |
| Detroit, Mich | M | L | L | M | M | H |
| Duluth-Superior, Minn.-Wis | M | MH | M | M | L | L |
| El Paso, Tex | MH | MH | M | M | M | L |
| Flint, Mich | M | L | L | M | M | M |
| Fort Lauderdale-Hollywood, Fla | M | H | M | M | M | L |
| Fort Worth, Tex | M | MH | M | M | M | L |
| Fresno, Calif | M | MH | H | M | M | L |
| Gary-Hammond-East Chicago, Ind | MH | L | H | M | L | M |
| Grand Rapids, Mich | L | MH | L | H | M | M |
| Greensboro-Winston-Salem-High Point, N. C. | L | H | L | M | H | M |
| Harrisburg, Pa | ML | L | M | L | M | L |
| Hartford, Conn | L | H | M | H | M | H |
| Honolulu, Hawaii | MH | MH | L | L | M | M |
| Houston, Tex | M | MH | M | M | M | M |
| Indianapolis, Ind | ML | MH | H | M | M | H |
| Jacksonville, Fla | H | MH | H | M | M | L |
| Jersey City, N. J | MH | L | M | M | M | H |
| Johnstown, Pa | H | L | H | M | L | L |
| Kansas City, Mo.-Kan | M | MH | M | M | M | M |
| Knoxville, Tenn | M | MH | M | L | M | L |

Table C-1. Values of area variables used in regressions by SMSA of residence--Continued

| Standard metropolitan statistical area | (1) CPS unemployment rate, 1966 average | (2) Nonagricultural employment change (BLS establishment) (A) 1965-66 | (2) Nonagricultural employment change (BLS establishment) (B) Feb.-March 1967 | (3) Relative opportunities youth, 1966 | (4) Relative opportunities women, 1966 | (5) Per capita personal income |
|---|---|---|---|---|---|---|
| Lancaster, Pa. | ML | MH | H | M | M | M |
| Lansing, Mich. | ML | MH | M | H | H | M |
| Los Angeles-Longbeach, and Anaheim-Santa Ana-Garden Grove, Calif. | H | MH | M | M | M | H |
| Louisville, Ky.-Ind. | ML | MH | M | M | M | M |
| Memphis, Tenn.-Ark. | H | H | M | L | M | L |
| Miami, Fla. | H | MH | M | M | H | M |
| Milwaukee, Wis. | ML | MH | H | H | M | H |
| Minneapolis-St. Paul, Minn. | ML | H | M | H | M | H |
| Mobile, Ala. | H | L | L | L | M | L |
| Nashville, Tenn. | L | H | L | M | M | L |
| New Haven, Conn. | ML | MH | M | H | M | H |
| New Orleans, La. | MH | MH | M | M | L | L |
| New York, N.Y. | MH | L | H | M | M | H |
| Newark, N. J. | MH | L | H | M | M | H |
| Norfolk-Portsmouth, Va. | MH | MH | H | L | M | L |
| Oklahoma City, Okla. | MH | MH | M | M | M | L |
| Omaha, Nebr.-Iowa | ML | MH | M | M | M | M |
| Orlando, Fla. | M | MH | M | L | M | L |
| Paterson-Clifton-Passaic, N.J. | M | MH | M | M | M | H |
| Peoria, Ill. | ML | MH | M | M | L | H |
| Philadelphia, Pa.-N. J. | MH | MH | M | M | M | M |
| Phoenix, Ariz. | H | H | M | M | M | L |
| Pittsburgh, Pa. | H | L | M | M | L | M |

Table C-1. Values of area variables used in regressions by SMSA of residence--Continued

| Standard metropolitan statistical area | (1) CPS unemployment rate, 1966 average | (2) Nonagricultural employment change (BLS establishment) (A) 1965-66 | (2) Nonagricultural employment change (BLS establishment) (B) Feb.-March 1967 | (3) Relative opportunities youth, 1966 | (4) Relative opportunities women, 1966 | (5) Per capita personal income |
|---|---|---|---|---|---|---|
| Portland, Oregon-Wash | ML | H | H | M | M | M |
| Providence, Pawtucket, Warwick, R.I.-Mass | MH | MH | M | M | M | M |
| Reading, Pa | L | ML | L | H | M | M |
| Richmond, Va | L | MH | H | M | M | M |
| Rochester, N. Y | M | MH | M | M | M | H |
| Sacramento, Calif | H | MH | M | M | M | H |
| St. Louis, Mo.-Ill | MH | MH | M | M | M | M |
| Salt Lake City, Utah | M | ML | H | H | M | L |
| San Antonio, Tex | MH | H | M | L | M | L |
| San Bernardino-Riverside-Ontario, Calif | H | MH | M | M | M | L |
| San Diego, Calif | H | H | M | M | M | M |
| San Francisco-Oakland, Calif | H | MH | M | M | M | H |
| San Jose, Calif | MH | H | H | M | M | M |
| Seattle-Everett, Wash | M | H | M | H | M | H |
| Shreveport, La | ML | MH | L | M | M | L |
| Spokane, Wash | H | MH | L | M | M | M |
| Apringfield-Chicopee-Holyoke, Mass.-Conn | M | MH | L | L | M | M |
| Syracuse, N.Y | ML | H | L | H | L | M |
| Takoma, Wash | H | H | H | M | M | L |
| Tampa-St. Petersburg, Fla | ML | MH | L | H | M | L |
| Toledo, Ohio-Mich | L | MH | M | L | M | M |
| Trenton, N. J | L | L | L | L | L | H |
| Tucson, Ariz | H | H | M | H | H | L |

Table C-1. Values of area variables used in regressions by SMSA of residence--Continued

| Standard metropolitan statistical area | (1) CPS unemployment rate, 1966 average | (2) Nonagricultural employment change (BLS establishment) (A) 1965-66 | (2) (B) Feb.-March 1967 | (3) Relative opportunities youth, 1966 | (4) Relative opportunities women, 1966 | (5) Per capita personal income |
|---|---|---|---|---|---|---|
| Tulsa, Okla. | L | MH | M | L | M | M |
| Washington, D. C.-Md.-Va. | L | MH | H | M | H | H |
| Wichita, Kans. | MH | H | L | M | M | M |
| Wilkes-Barre-Hazelton, Pa. | MH | MH | L | M | M | L |
| Wilmington, Del.-N.J.-Md. | ML | MH | M | M | M | H |
| Worcester, Mass. | ML | MH | M | H | M | M |
| Youngstown-Warren, Ohio | MH | MH | L | M | M | M |

| | (1) Percent | (2A) Percent | (2B) Percent | (3) Percent | (4) Percent | (5) |
|---|---|---|---|---|---|---|
| L = Low | Less than 2.5 | Less than 3.5 | Less than .2 | 0-71.9 | 0-61.9 | 0-$2,899 |
| ML = Medium low | 2.5-3.4 | 3.5-3.9 | -- | -- | -- | -- |
| M = Medium | 3.5-4.0 | -- | .2-.6 | 72.0-89.9 | 62.0-73.9 | $2,900-$3,399 |
| MH = Medium high | 4.1-5.0 | 4.0-6.4 | -- | -- | -- | -- |
| H = High | over 5.0 | over 6.4 | over .6 | over 89.9 | over 73.9 | over $3,399 |

Sources: Columns (1), (3), (4). CPS 1966 annual averages (12 monthly surveys).

Column (2A). Based on Employment and Earnings in States and Areas, 1939-1967. (BLS Bulletin 1370-5) table 7. Fort Worth, Beaumont, El Paso--State of Texas change. (BLS Bulletin 1370-5). Greensboro--State of North Carolina change. (BLS Bulletin 1370-5). Washington, D.C.--Based on BLS Bulletin 1370-4 due to change in SMSA definition.

Column (2B). Based on Employment and Earnings and Monthly Report on the Labor Force, (May 1967). Beaumont, El Paso and Fort Worth--State of Texas change. Greensboro--State of North Carolina change. Davenport, Fort Lauderdale and Peoria--Employment and Earnings and Monthly Report on the Labor Force, June 1967, also used.

Column (5). Robert E. Graham and Edwin J. Coleman, "Metropolitan Area Incomes, 1929-66," Survey of Current Business (August 1968), pp. 25-48, table 1.

Differences between SMSA's as defined in the study and 1967 Budget Bureau SMSA definitions. (Omitted from 1967 definition unless indicated.) 1967 definitions are given in Standard Metropolitan Statistical Areas (1967) 1/

Akron, Ohio
Portage County

Baltimore, Maryland
Hartford County

Birmingham, Alabama
Shelby County
Walker County

Boston, Massachusetts
Sherborn Town
Millis Town

Bridgeport, Connecticut
Easton Town

Charlotte, North Carolina
Union County

Cincinnati, Ohio-Ky.-Ind.
Clermont County
Warren County
Boone County

Cleveland, Ohio
Geauga County
Medina County

Columbus, Ohio
Delaware County
Pickaway County

Dallas, Texas
Kaufman County
Rockwall County

Davenport-Rock Island-Moline, Iowa-Illinois
Henry County

Dayton, Ohio
Preble County

Flint, Michigan
Lapeer County

Grand Rapids, Michigan
Ottawa County

Greensboro-Winston-Salem-High Point, North Carolina
Forsyth County
Randolph County
Yadkin County

Harrisburg, Pennsylvania
Perry County

Hartford, Connecticut
East Granby Town
Granby Town
Andover Town
Bolton Town
Coventry Town
Ellington Town

Houston, Texas
Brazoria County
Fort Bend County
Liberty County
Montgomery County

Indianapolis, Indiana
Boone County
Hamilton County
Hendricks County
Johnson County
Morgan County
Shelby County

Kansas City, Mo.-Kansas
Cass County
Platte County

Memphis, Tenn.-Ark.
Arkansas portion
Crittenden County

Milwaukee, Wisconsin
Ozaukee County
Washington County

Mobile, Alabama
Baldwin County

Nashville, Tennessee
Sumner County
Wilson County

New Haven, Connecticut
Bethany Town
North Branford Town

1/ Published by the U. S. Bureau of the Budget.

New Orleans, La.
St. Tammany Parish

Norfolk-Portsmouth, Virginia
Chesapeake City

Norfolk-Portsmouth, Virginia
Add: Princess Ann
South Norfolk City
Norfolk

Peoria, Illinois
Woodford County

Providence-Pawtucket-Warwick,
R.I.-Massachusetts
Rehoboth Town

Richmond, Virginia
Hanover County

Rochester, New York
Livingston County
Orleans County
Wayne County

Sacramento, California
Placer County
Yolo County

St. Louis, Mo.-Illinois
Franklin County

Salt Lake City, Utah
Davis County

San Antonio, Texas
Guadalupe County

San Francisco-Oakland, California
Add: Solano

Springfield-Chicopee-Holyoke,
Mass.-Conn.
Hampden Town
Southwick Town
Granby Town
Connecticut portion
Somers Town

Toledo, Ohio-Michigan
Wood County
Monroe County

Washington, D.C., Md.-Va.
Fairfax City
Loudon County
Prince William County

Wichita, Kansas
Butler County

Wilmington, Delaware-N.J.-Md.
Maryland portion
Cecil County

Worcester, Massachusetts
Paxton Town
Sterling Town

The SMSA classification used to designate the residence of persons in the Current Population Survey differs from that officially adopted by the Bureau of the Budget in 1967. This difference arises primarily because the sample design for the CPS was based on 1960 census SMSA definitions. If the counties or areas shown above are deleted from the official Bureau of the Budget 1967 definition, the SMSA's will be as they are defined by the Census Bureau.

Data from employment and earnings on employment change are based on employment in establishments in the SMSA, not on the SMSA of residence of persons as in the Current Population Survey. The definitions of SMSA's for establishment employment are more closely in conformity with the 1967 Bureau of the Budget definitions.

## Appendix D. Derivation of Labor Supply Functions

As discussed in chapter IV, the labor supply functions are derived under the hypothesis that the family maximizes its utility which is a function of family income and the leisure of each member of the family. The supply functions will first be derived for a family whose only potential income earners are the husband and the wife. 1/

$U(I,H,S)$ = Utility as a function of family income (I), hours of husband's leisure (H), and hours of wife's leisure (S).

$W_H$ = husband's wage rate

$W_S$ = wife's wage rate

$T$ = total hours in supply period

$Y$ = family unearned income

The family maximizes $U(I,H,S)$ subject to the time and income constraint:

$$(T-H)W_H + (T-S)W_S + Y = I$$

Maximizing with the Lagrange Multiplier $\lambda$, the first order conditions are:

(1)
$$U_H - \lambda W_H = 0$$
$$U_S - \lambda W_S = 0$$
$$U_I - \lambda = 0$$
$$(T-H)W_H + (T-S)W_S + Y = I$$

We assume that the second-order conditions hold. Total differentiation of (1) gives:

(2)
$$U_{HH}dH + U_{HS}dS + U_{HI}dI - W_H d\lambda = \lambda dW_H$$
$$U_{SH}dH + U_{SS}dS + U_{SI}dI - W_S d\lambda = \lambda dW_S$$
$$U_{IH}dH + U_{IS}dS + U_{II}dI - d\lambda = 0$$
$$-W_H dH - W_S ds - dI = -(T-H)dW_H - (T-S)dW_S - dY$$

1/ Essentially the same basic derivation served as the basis for Marvin Kosters' study, "Income and Substitution Parameters in a Family Labor Supply Model," Unpublished Ph. D. dissertation, University of Chicago, May 1966.

Let $D_{ij}$ equal the cofactor of the element (i,j) in the coefficient matrix for the set of equations (2), and let D equal the determinant of the matrix. The solution for dH is:

$$(3) \quad dH = \left(\frac{\lambda D_{11}}{D}\right) dW_H + \left(\frac{\lambda D_{21}}{D}\right) dW_S - [(T-H)\, dW_H + (T-S)dW_S + dY)]\, \frac{D_{41}}{D}$$

Equation (3) can be interpreted in terms of income and substitution effects. If $dW_H = dW_S = 0$ we can calculate the income effect for the change in the husband's demand for leisure.

$$\frac{\partial H}{\partial Y} = \frac{-D_{41}}{D}$$

The pure substitution effect, $\left(\frac{\partial H}{\partial W_H}\right)_{\bar{U}}$ utility held constant, can be derived as follows:

$U = U(I,H,S)$

Total differentiation of U gives:

$dU = U_I dI + U_H dH + U_S dS$

$U_I = \lambda$

$U_H = \lambda W_H$

$U_S = \lambda W_S$

$dU = \lambda dI + \lambda W_H dH + \lambda W_S dS$

$dU =$ for the pure substitution effect

$\lambda \neq 0$

Therefore $0 = dI + W_H dH + W_S dS$ and the right hand side of the last equation of (2) must equal zero if utility is held constant by making a compensating variation in income. Therefore

$$\left(\frac{\partial H}{\partial W_H}\right)_{\bar{U}} = \frac{\lambda D_{11}}{D}$$

and similarly

$$\left(\frac{\partial H}{\partial W_S}\right) = \frac{\lambda D_{21}}{D}$$

Substituting into (3):

$$dH = \left[\left(\frac{\partial H}{\partial W_H}\right)_{\bar{U}} + (T-S)\left(\frac{\partial H}{\partial Y}\right)\right] dW_H + \left[\left(\frac{\partial H}{\partial W_S}\right)_{\bar{U}} + (T-S)\left(\frac{\partial H}{\partial Y}\right)\right] dW_S + \left[\left(\frac{\partial H}{\partial Y}\right)\right] dY$$

Assuming that the terms in brackets are constant, integration of (4) gives:

$$(5)\quad H = a + \left[\left(\frac{\partial H}{\partial W_H}\right)_{\bar{U}} + (T-H)\left(\frac{\partial H}{\partial Y}\right)\right] W_H + \left[\left(\frac{\partial H}{\partial W_S}\right)_{\bar{U}} + (T-S)\left(\frac{\partial H}{\partial Y}\right)\right] W_S + \left[\left(\frac{\partial H}{\partial Y}\right)\right] Y$$

Similarly for the wife's leisure:

$$(6)\quad S = a' + \left[\left(\frac{\partial S}{\partial W_H}\right)_{\bar{U}} + (T-H)\left(\frac{\partial S}{\partial Y}\right)\right] W + \left[\left(\frac{\partial S}{\partial W_S}\right)_{\bar{U}} + (T-S)\left(\frac{\partial S}{\partial Y}\right)\right] W_S + \left[\left(\frac{\partial S}{\partial Y}\right)\right] Y$$

The supplies of labor for both husband and wife are determined simultaneously according to (5) and (6). If we assume that the cross substitution term, $\left(\frac{\partial H}{\partial W_S}\right)_{\bar{U}}$, equals zero then $\left(\frac{\partial S}{\partial W_H}\right)_{\bar{U}}$ equals zero since $\frac{\lambda D_{21}}{D} = \frac{\lambda D_{12}}{D}$ and equations (5) and (6) reduce to:

$$(7)\quad H = a + \left[\left(\frac{\partial H}{\partial W_H}\right)_{\bar{U}} + (T-H)\left(\frac{\partial H}{\partial Y}\right)\right] W_H + \left(\frac{\partial H}{\partial Y}\right)\left[(T-S)W_S + Y\right]$$

$$(8)\quad S = a' + \left[\left(\frac{\partial S}{\partial W_S}\right)_{\bar{U}} + (T-S)\left(\frac{\partial S}{\partial Y}\right)\right] W_S + \left(\frac{\partial S}{\partial Y}\right)\left[(T-H)W_H + Y\right]$$

The supply of labor is T minus the demand for leisure.

The supply equations are actually estimated as step functions with interactions between the wage and income variables. Therefore, we only need to assume that the substitution effects are constant between steps.

The derivation can easily be generalized to a family of more than two members. If the cross substitution terms are all zero, then the demand for leisure of the ith family member is

$$(9)\quad L_i = a'' + \left[\left(\frac{\partial L_i}{\partial W_i}\right)_{\bar{U}} + (T-L_i)\left(\frac{\partial L_i}{\partial Y}\right)\right] W_i + \left(\frac{\partial L_i}{\partial Y}\right)\left[I - (T-L_i)W_i\right]$$

$$\left(\frac{\partial L_i}{\partial W_j}\right)_{\bar{U}} = 0 \text{ for } i \neq j$$

## Appendix E. The Data and Some Estimation Problems

This appendix provides a description of the Current Population Survey (CPS) and the special uses of this survey made in this study. A general discussion of dummy independent and dependent variables and interaction variables is provided for readers not too familiar with these techniques. Finally, some special estimation problems arising from the complex statistical design of the current Population Survey are discussed.

### The Current Population Survey (CPS)

The Current Population Survey is a monthly survey, conducted by the Census Bureau, of approximately 50,000 occupied households. The sample includes 449 sample areas, covering every State and the District of Columbia. Information for more than 100,000 persons 14 years of age and over is collected every month in the survey. The survey is designed to provide information on the labor force status of the population, that is, the number of employed and unemployed as well as those outside the labor force. Detail is included on characteristics such as hours worked, occupation and industry of the employed and experienced unemployed and the duration of unemployment. Selected demographic data, such as educational attainment, age, sex and marital status also are obtained for each person.

In addition to the monthly survey, the Census Bureau carries out supplementary surveys to the CPS on related subjects, such as annual work experience and income, multiple job holders and school enrollment. The survey may also contain supplements sponsored by other agencies, such as television ownership, smoking habits, and incidence of and expenditures for hunting or fishing.

The Bureau of Labor Statistics carries out the analysis and publishes tabulations on the basic employment and unemployment data every month and analyzes and publishes the data from supplementary

questions relating to manpower and employment for persons 16 and over. 1/

The Bureau of the Census publishes data on the income of families and individuals as well as a number of other demographic subjects. 2/

Since 1959, the Bureau of the Census has preserved micro data from the Current Population Survey on magnetic tape.

The Bureau of Labor Statistics and the Bureau of the Census undertook a joint effort to edit, systematize and document the Person-Family File of 1959-67 in a standard format. Cumulatively, these files contain data on an aggregate sample of approximately 500,000 persons and 300,000 families. Because of the sample rotation plan followed by the Census, as many as 40 percent of these persons or families may have been interviewed in any 2 consecutive year periods. A brief description of these files is provided here. A fuller description of the Current Population Survey can be found elsewhere. 3/

The data available in the Person-Family File include questions asked in the February work experience supplement, in the March income supplement and the March basic questionnaire.

The Person-Family File consists of summary data for each interviewed family plus detailed data for each family member 14 and over. However, only persons 16 and over were included in the study.

All data which could identify a specific individual or family were removed from the records to insure the confidentiality of the data, consistent with the requirements of the Bureau of the Census. The following characteristics remained:

1/ The current reports are published in Employment and Earnings. The special reports are published in the Monthly Labor Review as Special Labor Force Reports.

2/ The Income of Families and Persons is published by the Census in the Current Population Reports Series P-60 Consumer Income. The Special Demographic Studies are published in the P-20 Series Population Characteristics. Some recent studies in this series include: Negro population, school enrollment, educational attainment, household and family characteristics, and marital and family status.

3/ See for example, Concepts and Methods Used in Manpower Statistics From the Current Population Survey, June 1967, issued jointly by the Bureau of Labor Statistics as Report No. 313 and by the Bureau of the Census as CPS Reports, Series P-23, No. 22.

For a more detailed description of the technical and statistical methodology used in the Current Population Survey see Bureau of the Census, The Current Population Survey: A Report on Methodology, Technical Paper No. 7. For general description of the Current Population Survey from the point of view of the researcher see J. E. Morton, Analytical Potential of the Current Population Survey for Manpower and Employment Research, (Kalamazoo, W. E. Upjohn Institute, 1965).

1. Summary family detail
   a. Type of family: primary, sub-family or secondary family
   b. Residence
      (i) Region
      (ii) Central city or not central city of SMSA
      (iii) In or out of poverty area as defined by the Bureau of the Census
      (iv) Name of SMSA if one of 96 of 104 largest SMSA's
   c. Family composition or household composition
      (i) Number of persons
      (ii) Age of children
   d. Total family income
      (i) Amount
      (ii) Sources
      (iii) Sources by amount
   e. Social Security Administration poverty code
2. Basic CPS questions relating to March of current year
   a. Age by single years
   b. Race
   c. Sex
   d. Veteran status
   e. Employment and labor force status last week
   f. How worked last week
   g. Reason for parttime work or no work
   h. Duration of unemployment
   i. Industry, occupation and class of worker
   j. Educational attainment
   k. Marital status
   l. Relationship to family head
3. Supplementary questions relating to previous year
   a. Regional mobility from previous year

b. Weeks worked

c. Main reason not working full year

d. Primarily full or parttime

e. Weeks unemployed

f. Occupation, industry or class of worker of longest job

g. Income by type and amount

All of this information can also be cross classified by combining characteristics of the head, wife, or all other family members. For example, income of the family head can be cross classified by educational attainment of the wife. Income of nonwife or head family members can be cross classified by the age of the wife of the family.

The data were edited to provide consistency within the labor force categories. The data were not edited for apparent inconsistencies between income, age, and labor force questions, such as 16 year old doctors with incomes over $25,000.

Sample Design of the CPS

The Current Population Survey is a sample survey based on a complex survey design. The country is divided into 1,913 primary sampling units (PSU's) which are grouped into 357 strata. One hundred seven of the largest SMSA's and five other areas were strata by themselves. The other strata consisted of a set of homogeneous PSU's. Within each of the remaining 245 strata, one or two PSU's were randomly selected for inclusion within the sample. Enumeration districts (ED's) were designated within each PSU. Some ED's were then selected randomly for inclusion within the sample. Within the selected ED, a cluster of 18 households was selected for inclusion in the sample. Each household consists of one or more families or unrelated individuals. Each family consists of two or more individuals. 4/

4/ See the sources cited in footnote 3 for a further description of the CPS.

Because of the complex sample design, an ordinary regression model would not provide best linear unbiased estimates of the regression coefficients for the population. By using a Census-Bureau-weighted regression, we might be able to provide unbiased estimates of the population "B" coefficients but could not assure that they are minimum variance. A further discussion of the appropriate estimation technique is taken up in a later section.

Dummy Variables and Interactions

This study uses dummy independent variables in a multiple regression framework. Dummy variables may be used: (1) For categorical variables such as race, sex, and place of residence; (2) where errors in variables exist; and (3) to take account of nonlinear effects of continuous variables. Dummy variables can also take account of the additional effects of interactions between variables.

Cross tabulations could also be used and, provided all interactions are properly specified, the estimates of the cell means from the regression will be identical to the cell means in the cross tabulation. The advantages of using the regression approach are:

1. The regression approach provides a convenient scheme specifying only certain interactions. In a single cross tabulation, all interactions must be specified. A regression may omit nonsignificant interactions. For example, if we are interested in labor force participation by sex and race, a hypothetical array of the proportion of persons in the labor force might be produced as follows:

| | Male | Female |
|---|---|---|
| White..... | .90 | .60 |
| Negro..... | .70 | .50 |
| Other..... | .60 | .40 |

Six cells are required in order to produce the array. The same result could be achieved with equation (1) only, which has five terms.

$$L = .40 + .20\ S + .10\ R1 + .20\ R2 + .10\ SR2 \qquad (1)$$

S, R1, R2 and SR2 are dummy variables. If the individual is a male, S = 1; if the individual is a female, S = 0. If the individual is white, R1 = 0 and R2 = 1. If the individual is Negro, R1 = 1 and R2 = 0. If the individual is neither white nor Negro, R1 and R2 are both zero. The interaction variable is one if both S and R2 are one and zero otherwise. If a regression were run with individuals as observations, L would be assigned the value of one for all individuals in the labor force and a value of zero for all individuals not in the labor force.

As the number of factors to be analyzed, such as race, sex, marital status and educational attainment increases and the number of levels of each factor, such as the levels of education attained, the case for the regression approach over the cross tabulation approach becomes stronger.

The ability to omit nonsignificant interactions from the specification of the model increases the number of variables that the analyst can consider in a single regression.

2. The regression approach provides a convenient setting for testing the hypothesis that differences between levels of a factor are significant. Returning to our example in equation (1), the coefficient of sex represents the difference in labor force participation between men and women. However, because the interaction term is non-zero, this difference is not the same for whites and Negroes and others. Standard errors may be computed for the regression coefficients and tests of significance can also be applied.

3. The regression approach provides a set of summary measures of the significance of certain effects which may be much easier to evaluate than many thousand cells of a table.

Selection of Interactions

The interaction variables in this study were selected by a priori specifications. However, because our theoretical knowledge of interaction effects is weaker than our theoretical knowledge of the variables

to be included in the model, we made a further test of interaction variables. We tested the null hypothesis that the interaction variables excluded from our model were zero by fitting a regression involving all possible interaction terms to the dependent variable. We compared the variance explained by this second model to the variance explained by our model and investigated the source of any discrepancies. The differences were not sufficiently great between the two models to justify the continued use of this technique in all regressions, suggesting that our a priori choices of interactions were generally good. In a few instances, however, the second model improved the specification of our original model.

Special Estimating Problems

Some alternative estimating procedures are discussed separately for continuous and dichotomous dependent variables in this section.

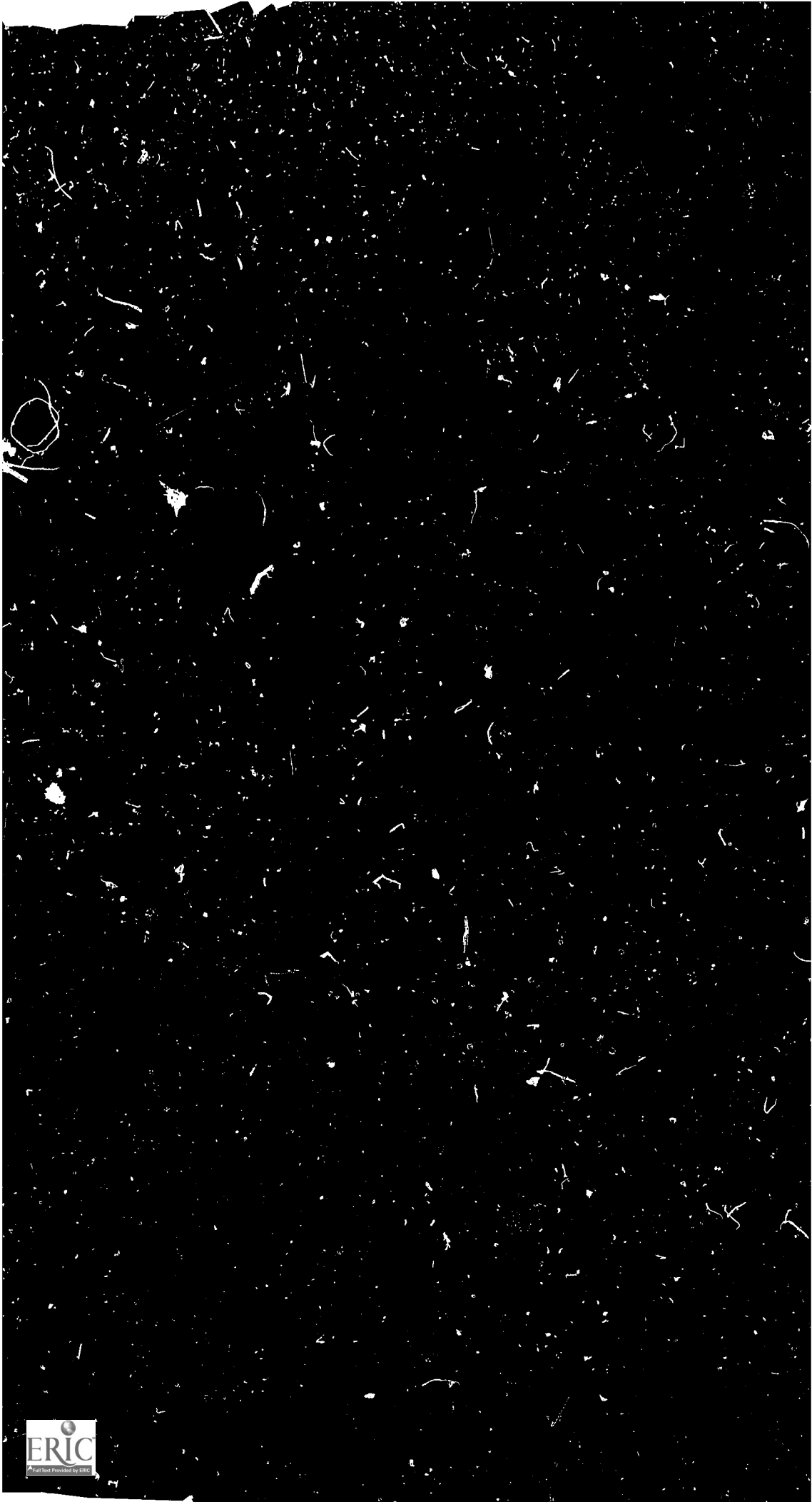
Continuous Dependent Variable. We hypothesize that $Y = X B + U$, where Y and U are column vectors of length n; and n is the number of observations in the sample. The Y variable is the continuous measure of labor supply discussed in chapter II. X is the nxk matrix of observations where k is the number of independent variables. It is assumed that the X matrix is fixed in repeated samples. 5/ The B vector is of length k.

We hypothesize that variance-covariance matrix of the errors is given by (3).

$$E(U U') = \sigma^2 \Omega. \qquad (3)$$

where $\sigma^2$ is the variance and $\Omega$ is a square diagonal matrix (n x n). This is the generalized linear regression model discussed by Goldberger.

The Census Bureau provides a vector of weights--a weight for each person in the sample which should produce unbiased estimates of the population B coefficients. We shall designate a diagonal matrix of



order n of the weights as w.

We assume $\Omega$ is given by:

$$\Omega = \begin{bmatrix} \frac{1}{W_1^2} & 0 & 0 & \cdots & 0 \\ 0 & 1/W_2^2 & 0 & \cdots & 0 \\ \cdots & \cdots & \cdots & \cdots & 1/W_n^2 \end{bmatrix} \qquad (4)$$

Then if we premultiply by the weight matrix w, will obtain:

$$Y^* = X^* B + U^*, \qquad (5)$$

where $Y^* = WY$ and $X^* = WX$ and $U^* = WU$.

We can show that,

$$E(U^* U^*) = \sigma^2 I \qquad (6)$$

If equation (5) holds, the classical least squares model can be applied to the weighted regression. 6/

There are several problems with our assumptions. First, we have no idea whether $\Omega$ is given by (4). Second, the weights supplied by Census theoretically provide us with unbiased estimates of a so-called population which we know is under-counted. Third, the weights are designed to provide unbiased estimates for certain controlled tabulations only. If we use the weights for all tabulations, there is no guarantee that the resulting estimates will be unbiased. Fourth, the data are drawn from a clustered stratified random sample so that observations within a cluster are correlated. Thus, $\Omega$ is not diagonal and (6) does not hold. For these reasons, the weights were discarded and ordinary least squares was used with the caution that the estimates are only approximate.

Some Actual Comparisons. To see the effect of weighting on the predicted labor force participation rates, we tabulated labor force participation rates by age, sex and race, first weighted and then unweighted. Five age groups were used (16-21, 22-34, 35-54, 55-64 and

5/ This assumption is not strictly true, but it is probably a good enough approximation for our purposes.

6/ Goldberger, op. cit., p. 234.

65 and over) and two race groups (white and all other).

At most, .4 of a percentage point separated the weighted and unweighted tabulations by sex and age for whites.

The differences between the weighted and unweighted rates for nonwhites was much greater as seen by table E-1.

A weighted and an unweighted regression was compared using March labor force status as the dependent variable and age, marital and race as explanatory variables. The regression was estimated only for adult women. The deviations in labor force participation were measured from the following arbitrary levels:

Age: 22-24

Race: White

Marital status: Married, husband present

The other levels included in the model were:

| Age | Race | Marital status |
|---|---|---|
| 25 to 34 years | | |
| 35 to 44 years | Negro | Other, never married |
| 45 to 54 years | Other | Never married |
| 55 to 61 years | | |
| 62 to 64 years | | |
| 65 years and over | | |

All possible interactions were also included in the regression. The results of the weighted and unweighted regressions were fairly similar. In both regressions 63 terms were included. Of the 63 terms, the same 24 terms were significant at the 95 percent confidence level in both regressions. However, in the weighted regression two additional terms were significant, but just barely so. (t values equal to 1.99 and -2.08.) $R^2$ was computed to be .156 in the unweighted regression and .158 in the weighted regression.

The use of ordinary least squares leads to an understatement of the standard errors of the coefficients. This understatement arises because the Current Population Survey is not a simple random sample, but has a complex sample design. The two departures from a simple random sample are stratification, which tends to increase efficiency and

Table E-1. Weighted and unweighted labor force participation rates by sex and age for Negroes and others, March 1967
(In percent)

| Age | Male | | Female | |
|---|---|---|---|---|
| | Weighted | Unweighted | Weighted | Unweighted |
| 16 to 21 years..... | 46.9 | 47.5 | 34.0 | 34.0 |
| 22 to 34 years..... | 95.4 | 95.6 | 55.3 | 57.5 |
| 35 to 54 years..... | 91.8 | 91.6 | 60.3 | 61.6 |
| 55 to 64 years..... | 77.3 | 76.9 | 49.8 | 48.1 |
| 65 years and over..... | 24.3 | 23.1 | 14.5 | 15.7 |

SOURCE: Based on a 67 percent sample of the March 1967 CPS.

clustering, which tends to decrease the efficiency for a given sample size. 7/ Table E-2 compares standard errors of a proportion calculated from a simple random sample with standard errors computed from the CPS. It suggests that the design effect of the CPS is small for labor force estimates. The design effect is usually measured by the square of the ratio of a standard error computed from a complex sample design to the same standard error computed from a simple random sample. The design effect is not constant but will vary for different proportions, for different sample sizes and for different variables. The design effect is further minimized in a regression which includes independent variables which correlate with the factors that give rise to cluster homogeneity. It is believed that our variables correlate with these factors.

Table E-2 also indicates that the stratification effect actually outweighs the clustering effect for samples under 5,000. This result holds for proportions calculated from the national sample only, and would not be true for proportions calculated from the 96 largest SMSA's, as are most regressions in the monograph. Furthermore, the variance is computed for a composite estimate which our regressions are not. Both factors would increase the standard error of the CPS estimates shown in table E-2.

Nevertheless, the average effect of all these factors is to result in a very small overstatement of the standard errors.

A more precise approach to the estimation of standard errors of regressions in complex designs is the split half replication method suggested by McCarthy and Kish. The method is very costly to apply, however, and therefore was not used here in light of the small bias indicated by our analysis.

7/ Clustering reduces the cost of the survey for a given sample size. The reduction in cost compensates for the reduction in efficiency.

Table E-2. Standard error of percentage for simple random sample and CPS estimate

| Base of percent (sample size) | Simple random sample estimated percent 1/ | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 or 99 | 2 or 98 | 5 or 95 | 10 or 90 | 20 or 80 | 35 or 65 | 50 |
| 150.... | 0.81 | 1.14 | 1.78 | 2.45 | 3.27 | 3.89 | 4.08 |
| 250.... | 0.63 | 0.89 | 1.38 | 1.90 | 2.53 | 3.02 | 3.16 |
| 500.... | 0.44 | 0.63 | 0.97 | 1.34 | 1.79 | 2.13 | 2.24 |
| 1,000.... | 0.31 | 0.44 | 0.69 | 0.95 | 1.26 | 1.51 | 1.58 |
| 5,000.... | 0.14 | 0.20 | 0.31 | 0.42 | 0.57 | 0.67 | 0.71 |
| 10,000.... | 0.10 | 0.14 | 0.22 | 0.30 | 0.40 | 0.48 | 0.50 |
| 25,000.... | 0.06 | 0.09 | 0.14 | 0.19 | 0.25 | 0.30 | 0.32 |
| 75,000.... | 0.04 | 0.05 | 0.08 | 0.11 | 0.15 | 0.17 | 0.18 |
| | CPS estimated percent 2/ | | | | | | |
| 150.... | .8 | 1.3 | 1.9 | 2.6 | 3.5 | 4.1 | 4.2 |
| 250.... | .6 | .9 | 1.5 | 2.0 | 2.6 | 3.2 | 3.4 |
| 500.... | .5 | .7 | 1.0 | 1.4 | 1.8 | 2.1 | 2.3 |
| 1,000.... | .3 | .4 | .7 | 1.0 | 1.4 | 1.6 | 1.6 |
| 5,000.... | .2 | .2 | .3 | .4 | .7 | .7 | .7 |
| 10,000.... | .1 | .2 | .3 | .3 | .4 | .5 | .5 |
| 25,000.... | .1 | .1 | .2 | .2 | .3 | .3 | .3 |
| 75,000.... | .1 | .1 | .1 | .1 | .2 | .2 | .2 |

1/ Based on $S = \frac{P(1-P)}{n}$, where S is the standard error, P is the percent, and n is the sample size.

2/ Interpolated from table D, U.S. Department of Labor, Employment and Earnings and Monthly Report on the Labor Force, October 1967. Based on a ratio of sample to population of 1:1170.

Dichotomous Dependent Variable. If Y is dichotomous, applying the weights to the original observations will not produce minimum variance estimates of the regression coefficients even if the tenuous assumptions in the previous model held. Goldberger shows that if Y is dichotomous, equation (6) is untenable because the errors are heteroscedastic. 8/ To correct for this problem, Goldberger suggests a two-state or generalized least squares procedure which will make an estimate of $\Omega^*$ from the first stage and substitute the estimate in the second stage. If the model is otherwise properly specified (i.e., all non-zero interactions are included), the use of ordinary least squares will usually lead to over-estimates of the standard errors. Thus, if the null hypothesis is rejected that a coefficient is zero, the generalized least squares model would only reconfirm the conclusion.

Table E-3 compares the differences between the coefficients and standard errors corrected and uncorrected for heteroscedasticity. 9/

The correction, on the average, resulted in a very small decrease in the standard errors. However, this understatement of the standard error is balanced somewhat by the clustering in the sample design. It didn't seem worth the extra cost to rerun all regressions to correct for heteroscedasticity. Furthermore, the correction breaks down if non-additivity is serious such that a predicted value of a dependent variable for an observation exceeds one or is less than zero. It is then necessary to constrain Y to a value between 0 and 1, such as .99.

When the dependent variable is dichotomous, the regression is a linear probability function and the predicted value of the dependent variable is the probability that the individual will be in the labor force. When the dependent variable is dichotomous, a calculation is made of the probability of correctly predicting individual behavior. An estimate of this probability is given by:

8/ Goldberger, op. cit.
9/ The correction used was to compute $(X'X)^{-1}(X'\Omega X)(X'X)^{-1}$ in place of $\sigma^2(X'X)^{-1}$. See Ashenfelter.

Table E-3. Coefficients and standard errors corrected and uncorrected for heteroscedasticity

| Term | Wives living in largest 96 SMSA's 1/ | | |
|---|---|---|---|
| | B coefficient | Uncorrected standard error | Corrected standard error |
| 1. Constant | .3786 | .0043 | .0044 |
| 2. Negro and other | .1523 | .0125 | .0130 |
| 3. Age 55 and over | .1529 | .0089 | .0082 |

Note: $R^2$ = .027. Number of observations = 16,907. Mean of dependent variable = .36.

1/ Dependent variable, in or out of the labor force during March 1967.

$$P_{IND} = \frac{\sum_{i=1}^{n} (\hat{Y}_i - .5) + .5}{n} \qquad (7)$$

where $\hat{Y}_i$ is the predicted value of the dependent variable. It assumes that we predict an individual to be in the labor force if the probability of the individual's being in the labor force exceeds .5. If n is large enough, (7) is a good estimate of the probability for the universe.

This probability is of limited use. For example, for adult men, age 22 to 54, this probability will be at least 0.96 even if the independent variables explain none of the variation in labor force participation. It is useful, however, as a contrast to the typically low $R^2$ which is reported for most of the regressions. For example, if $P_{IND}$ were 0.96 and $R^2$ were .05, a valid use of this measure would be to argue that even though only 5 percent of the variance in the dependent variable was explained, we have over a 96 percent probability of predicting an individual's labor force status.

A special algorithm was used to calculate the regressions used in this study. It is available on request from the authors.

## Appendix F

Table F-1. Labor force participation regression of men age 22 to 54 living in 96 SMSA's
[Dependent variable: in or out of the labor force in March 1967]

| Independent variables | b coefficient | T value |
|---|---|---|
| Constant | .9180 | 72.4 |
| Years of schooling completed: | | |
| 0 to 7 | -- | -- |
| 8 to 11 | .0421 | 3.7 |
| 12 | .0690 | 6.2 |
| 13 to 15 | .0324 | 2.6 |
| 16 | .0555 | 4.4 |
| 17 and over | .0296 | 2.2 |
| Marital status: | | |
| Not married, spouse present | -- | -- |
| Married, spouse present | .0278 | 4.5 |
| Region of residence: | | |
| Non-South | -- | -- |
| South | .0033 | 0.9 |
| Residence in poverty trace: | | |
| Nonpoverty tract | -- | -- |
| Poverty tract | -.0230 | -1.9 |
| Unemployment rate (1966 average): (in percent) | | |
| Under 3.5 | -- | -- |
| 3.5 to 4.9 | .0035 | .3 |
| 5.0 and higher | -.0231 | -1.5 |
| Employment change (February-March 1967): (in percent) | | |
| Under 0.2 | -- | -- |
| 0.2 to 0.6 | .0005 | 0.1 |
| 0.7 or higher | .0034 | 0.6 |
| FILOW: (in thousands of dollars): | | |
| Less than $500 and negative | -- | -- |
| 500 to $999 | -.0680 | -4.0 |
| 1,000 to 1,499 | -.1131 | -6.9 |
| 1,500 to 2,499 | -.0878 | -5.7 |
| 2,500 to 3,999 | -.1509 | -10.5 |
| 4,000 to 5,999 | -.0914 | -6.8 |
| 6,000 to 7,999 | -.1522 | -11.9 |
| 8,000 and over | -.1703 | -17.9 |
| Interaction (Marital status and FILOW) | | |
| Married, spouse present FILOW: | | |
| $500 to $999 | .0680 | 3.8 |
| 1,000 to 1,499 | .0977 | 5.5 |
| 1,500 to 2,499 | .0713 | 4.3 |
| 2,500 to 3,999 | .1278 | 8.4 |
| 4,000 to 5,999 | .0658 | 4.5 |
| 6,000 to 7,999 | .1243 | 8.4 |
| 8,000 and over | .1215 | 9.8 |

Table F-1. Labor force participation regression of men age 12 to 54 living in 96 SMSA's--Continued

[Dependent variable: in or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| **Interaction (years of schooling completed and unemployment rate)** | | | |
| Years of schooling completed: | Unemployment rate: (in percent) | | |
| 8 to 11..... | 3.5 to 4.9..... | .0035 | 0.2 |
| 8 to 11..... | 5.0 and over.... | .0217 | 1.2 |
| 12..... | 3.5 to 4.9..... | -.0044 | -0.3 |
| 12..... | 5.0 and over.... | .0110 | 0.6 |
| 13 to 15..... | 3.5 to 4.9..... | .0121 | 0.8 |
| 13 to 15..... | 5.0 and over.... | .0101 | 0.5 |
| 16..... | 3.5 to 4.9..... | -.0168 | -1.0 |
| 16..... | 5.0 and over.... | .0261 | 1.3 |
| 17..... | 3.5 to 4.9..... | -.0099 | -0.6 |
| 17..... | 5.0 and over.... | .0318 | 1.5 |
| **Interaction (employment change and residence in poverty tract)** | | | |
| Employment change: (in percent) | Residence in poverty tract: | | |
| 0.2 to 0.6..... | In poverty tract... | .0103 | 0.8 |
| 0.7 or higher... | In poverty tract... | .0044 | 0.3 |

$R^2$ = .084 N = 15,285

Mean of DV = .9625 SEE = .1821

Probability of making a correct prediction = .963

Table F-2. Labor force participation regression of men 55 and over living in 96 SMSA's
[Dependent variable: in or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .9799 | 29.4 |
| Age: | | |
| 55 to 59 | -- | -- |
| 60 to 61 | -.0638 | - 3.8 |
| 62 to 64 | -.1480 | - 9.4 |
| 65 to 71 | -.4649 | -33.3 |
| 72 and over | -.4625 | - 7.4 |
| Years of schooling completed: | | |
| 0 to 7 | -- | -- |
| 8 to 11 | .0194 | .9 |
| 12 | .0712 | 2.9 |
| 13 to 15 | .0557 | 1.6 |
| 16 | .0618 | 1.5 |
| 17 and over | .0375 | .8 |
| Marital status: | | |
| Not married, spouse present | -- | -- |
| Married, spouse present | .0006 | 0.0 |
| Residence in poverty trace: | | |
| Non-poverty tract | -- | -- |
| Poverty tract | -.0054 | - 0.2 |
| Unemployment rate (1966 average): (in percent) | | |
| Under 3.5 | -- | -- |
| 3.5 to 4.9 | -.0305 | - 1.4 |
| 5.0 and higher | -.0682 | - 2.7 |
| Employment change (February-March 1967): (in percent) | | |
| Under 0.2 | -- | -- |
| 0.2 to 0.6 | .0272 | 1.5 |
| 0.7 or higher | .0383 | 2.0 |
| FILOW: (in dollars): | | |
| Less than $500 and negative | -- | -- |
| 500 to 1,499 | -.2459 | - 7.1 |
| 1,500 to 2,999 | -.3165 | - 9.3 |
| 3,000 to 4,999 | -.2890 | - 7.1 |
| 5,000 and over | -.3178 | - 9.8 |
| **Interaction (Marital status and FILOW)** | | |
| Married, spouse present FILOW: | | |
| $500 to 1,499 | .1354 | 3.6 |
| 1,500 to 2,999 | .0786 | 2.2 |
| 3,000 to 4,999 | .0830 | 1.9 |
| 5,000 and over | .1367 | 4.0 |
| **Interaction (Age and FILOW)** | | |
| Age: FILOW: | | |
| 72 and over.... $500 to 1,499.. | -.1857 | - 2.7 |
| 72 and over.... 1,500 to 2,999.. | -.1839 | - 2.8 |
| 72 and over.... 3,000 to 4,999.. | -.2265 | - 3.3 |
| 72 and over.... 5,000 and over.. | -.2070 | - 3.1 |

Table F-2. Labor force participation regression of men 55 and over living in 96 SMSA's--Continued
[Dependent variable: in or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| **Interaction (years of schooling completed and unemployment rate)** | | | |
| Years of schooling completed: | Unemployment rate: (in percent) | | |
| 8 to 11..... | 3.5 to 4.9..... | .0275 | 1.0 |
| 8 to 11..... | 5.0 and over.... | .0298 | 0.9 |
| 12..... | 3.5 to 4.9..... | .0174 | 0.5 |
| 12..... | 5.0 and over.... | .0206 | 0.5 |
| 13 to 15..... | 3.5 to 4.9..... | .0944 | 2.0 |
| 13 to 15..... | 5.0 and over.... | .0757 | 1.4 |
| 16..... | 3.5 to 4.9..... | .1475 | 2.9 |
| 16..... | 5.0 and over.... | .0292 | 0.5 |
| 17..... | 3.5 to 4.9..... | .1081 | 1.9 |
| 17..... | 5.0 and over.... | .1566 | 2.3 |
| **Interaction (age and years of schooling completed)** | | | |
| Age: | Years of schooling completed: | | |
| 65 to 71..... | 16..... | .0777 | 1.5 |
| 65 to 71..... | 17 and over..... | .1358 | 2.3 |
| 72 and over.. | 16..... | -.0105 | -0.2 |
| 72 and over.. | 17 and over..... | .2016 | 2.8 |
| **Interaction (employment change and residence in poverty tract)** | | | |
| Employment change: (in percent) | Residence in poverty tract: | | |
| 0.2 to 0.6..... | In poverty tract... | -.0543 | -1.4 |
| 0.7 or higher... | In poverty tract... | -.0405 | -1.0 |

$R^2$ = .455 N = 6,102
Mean of DV = .5649 SEE = .3672
Probability of making a correct prediction = .807

Table F-3. Labor force participation regression of men age 22 to 54, not ill or in school, who worked one or more weeks in 1966
[Dependent variable: hours supplied during 1966]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | 2204.9 | 63.13 |
| Years of schooling completed: | | |
| 0 to 7 | 0 | -- |
| 8 to 11 | 132.8 | 9.93 |
| 12 | 198.0 | 14.89 |
| 13 to 15 | 216.6 | 13.75 |
| 16 | 282.3 | 16.60 |
| 17 and over | 372.5 | 19.53 |
| Marital status: | | |
| Not married, spouse present | 0 | -- |
| Married, spouse present | 378.8 | 10.64 |
| Own children under 18: | | |
| No children | 0 | -- |
| Children | - 51.8 | -1.40 |
| Residence in poverty tract: | | |
| Nonpoverty tract | 0 | -- |
| Poverty tract | - 89.7 | -8.85 |
| Region of residence: | | |
| Non-South | 0 | -- |
| South | 3.8 | 0.44 |
| Race: | | |
| White | 0 | -- |
| Negro and other | -128.0 | -7.75 |
| Self-employment: | | |
| Not self-employed | 0 | -- |
| Self-employed | 332.4 | 28.98 |
| Hourly wage rate: | | |
| Under $1.00 | 0 | -- |
| $1.00 to 2.49 | - 73.1 | -1.94 |
| 2.50 to 4.99 | -357.6 | -9.73 |
| 5.00 and over | -520.9 | -10.85 |
| FILOW: (in dollars) | | |
| Less than $500 and negative | 0 | -- |
| 500 to 1,499 | -188.4 | -7.64 |
| 1,500 to 3,499 | -122.6 | -3.15 |
| 3,500 and over | -233.4 | -6.21 |
| Interaction (Hourly wage rate and FILOW) | | |
| Hourly wage rate: FILOW: | | |
| $1.00 to 2.49.... $500 to 1,499.. | 139.6 | 3.09 |
| 1.00 to 2.49.... 1,500 to 3,499.. | - 2.15 | - .05 |
| 1.00 to 2.49.... 3,500 and over.. | 144.3 | 3.52 |
| $2.50 to 4.99. .. $500 to 1,499.. | 162.9 | 3.77 |
| 2.50 to 4.99.... 1,500 to 3,499.. | 77.1 | 1.86 |
| 2.50 to 4.99.... 3,500 and over.. | 172.8 | 4.39 |
| $5.00 and over... $500 to 1,499.. | 178.5 | 3.61 |
| 5.00 and over... 1,500 to 3,499.. | 103.1 | 2.10 |
| 5.00 and over... 3,500 and over.. | 237.4 | 5.16 |

Table F-3. Labor force participation regression of men age 22 to 54, not ill or in school, who worked one or more weeks in 1966--Continued
[Dependent variable: hours supplied during 1966]

| Interactions | B coefficient | T value |
|---|---|---|
| Interaction (married, spouse present and hourly wage rate) | | |
| Married, spouse present: | | |
| Hourly wage rate: | | |
| $1.00 to 2.49..... | -175.8 | -4.47 |
| 2.50 to 4.99..... | -219.0 | -5.70 |
| 5.00 and over..... | -191.4 | -3.75 |
| Interaction (married, spouse present and own children under 18) | | |
| Married, spouse present: | | |
| Children under 18 years of age.. | 119.2 | 4.52 |
| Interaction (own children under 18 and hourly wage rate | | |
| Children under 18 years of age: | | |
| Hourly wage rate: | | |
| $1.00 to 2.49..... | 66.7 | 1.88 |
| 2.50 to 4.99..... | 20.4 | 0.5º |
| 5.00 and over..... | - 16.4 | -0.40 |
| Interaction (region of residence and race) | | |
| South: | | |
| Negro and other..... | - 78.0 | -3.23 |

$R^2$ = .179
Mean of DV = 2304.9

N = 24,718
SEE = 543.2

Table F-4. Labor force participation regression of men 55 and over, not ill, who worked one or more weeks in 1966

[Dependent variable: hours supplied during 1966]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | 2315.4 | 37.65 |
| Age: | | |
| 55 to 62 years | 0 | -- |
| 63 to 65 years | -237.8 | -10.05 |
| 66 to 72 years | -690.1 | -28.84 |
| 73 and over | -640.9 | - 5.37 |
| Years of schooling completed: | | |
| 0 to 7 | 0 | -- |
| 8 to 11 | 79.3 | 3.52 |
| 12 | 199.9 | 7.47 |
| 13 to 15 | 229.4 | 6.45 |
| 16 | 339.2 | 8.16 |
| 17 and over | 441.7 | 9.32 |
| Marital status: | | |
| Not married. spouse present | 0 | -- |
| Married, spouse present | 134.9 | 2.67 |
| Residence in poverty tract: | | |
| Nonpoverty tract | 0 | -- |
| Poverty tract | - 52.2 | - 2.30 |
| Race: | | |
| White | 0 | -- |
| Negro and other | -121.30 | - 3.84 |
| Self-employment: | | |
| Not self-employed | 0 | -- |
| Self-employed | 290.1 | 6.89 |
| Hourly wage rate: | | |
| Under $1.00 | 0 | -- |
| 1.00 to 2.49 | - 67.7 | - 0.94 |
| 2.50 to 4.99 | -363.8 | - 5.08 |
| 5.00 and over | -526.1 | - 5.20 |
| FILOW: (in dollars) | | |
| Less than $500 and negative | 0 | -- |
| 500 to 1,499 | -111.0 | - 1.80 |
| 1,500 to 3,499 | -239.0 | - 3.98 |
| 3,500 and over | -226.1 | - 3.57 |
| Interaction (Hourly wage rate and FILOW) | | |
| Hourly wage rate: FILOW: | | |
| $1.00 to 2.49... $500 to 1,499... | - 34.9 | - 0.47 |
| 1.00 to 2.49... 1,500 to 3,499... | 10.7 | 0.15 |
| 1.00 to 2.49... 3,500 and over... | 110.5 | 1.51 |
| 2.50 to 4.99... 500 to 1,499... | - 21.7 | - 0.30 |
| 2.50 to 4.99... 1,500 to 3,499... | - 4.93 | - 0.07 |
| 2.50 to 4.99... 3,500 and over... | 60.0 | 0.86 |
| 5.00 and over.. 500 to 1,499... | 111.4 | 1.18 |
| 5.00 and over.. 1,500 to 3,499... | 251.4 | 2.72 |
| 5.00 and over.. 3,500 and over... | 209.3 | 2.47 |

Table F-4. Labor force participation regression of men 55 and over, not ill, who worked one or more weeks in 1966--Continued

[Dependent variable: hours supplied during 1966]

| Interactions | B coefficient | T value |
|---|---|---|
| Interaction (married, spouse present and hourly wage rate) | | |
| Married, spouse present: | | |
| Hourly wage rate: | | |
| $1.00 to 2.49..... | - 21.1 | - 0.32 |
| 2.50 to 4.99..... | 41.7 | 0.65 |
| 5.00 and over..... | - 1.2 | - 0.01 |
| Interaction (self-employment and hourly wage rate) | | |
| Self-employed: | | |
| Hourly wage rate: | | |
| $1.00 to 2.49..... | -115.1 | - 2.08 |
| 2.50 to 4.99..... | - 96.6 | - 1.66 |
| 5.00 and over..... | -266.0 | - 3.79 |
| Interaction (age and FILOW) | | |
| Age: FILOW: | | |
| 73 and over.. $500 to 1,499.. | -368.6 | - 2.70 |
| 73 and over.. 1,500 to 3,499.. | -308.7 | - 2.35 |
| 73 and over.. 3,500 and over.. | -312.4 | - 2.30 |
| Interaction (years of schooling completed) | | |
| Years of schooling: Age: | | |
| 17 and over.. 66 to 72 years | 34.9 | 0.34 |
| 17 and over.. 73 and over... | - 35.1 | - 0.22 |

$R^2$ = .246 N = 6,761
Mean of DV = 2038.7 SEE = 669.7

Table F-5. Labor force participation regression of all women, age 22 and over living in largest 96 SMSA's
[Dependent variable: in or out of labor force during March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .3806 | 13.7 |
| Marital status: | | |
| Married, spouse present | -- | -- |
| Married, other | .1996 | 18.5 |
| Never married | .3589 | 27.7 |
| Age: | | |
| 22 to 54 | -- | -- |
| 55 to 64 | -.0468 | - 4.6 |
| 65 and over | -.2257 | - 7.5 |
| Years of schooling completed: | | |
| 0 to 4 years | -- | -- |
| 5 to 8 years | .0923 | 4.3 |
| 9 to 11 years | .1360 | 6.4 |
| 12 to 15 years | .1874 | 9.1 |
| 16 years and over | .2647 | 11.8 |
| FILOW: (in dollars) | | |
| Less than $1,500 and negative | -- | -- |
| 1,500 to 7,499 | -.1513 | -16.4 |
| 7,500 and over | -.2364 | -24.0 |
| Unemployment rate (1966 average): (in percent) | | |
| Under 2.5 | -- | -- |
| 2.5 to 3.4 | -.0308 | - 2.4 |
| 3.5 to 4.0 | -.0339 | - 2.6 |
| 4.1 to 5.0 | -.0288 | - 2.3 |
| 5.1 and over | -.0351 | - 2.7 |
| Employment change (1965-66): (in percent) | | |
| Under 3.5 | -- | -- |
| 3.5 to 6.49 | .0321 | 4.2 |
| 6.50 and over | .0474 | 4.7 |
| Relative employment opportunities: (in percent) | | |
| Under 62 | -- | -- |
| 62 to 73.9 | .0395 | 3.4 |
| 74.0 and over | .0586 | 3.4 |
| Interaction (Marital status and age) | | |
| Marital status: Age: | | |
| Other 55 to 64 | -.0793 | - 4.3 |
| Other 65 and over | -.1989 | -10.7 |
| Never married 55 to 64 | -.1384 | - 4.3 |
| Never married 65 and over | -.2988 | - 9.6 |

Table F-5. Labor force participation regression of all women, age 22 and over living in largest 96 SMSA's--Continued
[Dependent variable: in or out of labor force during March 1967]

| Interaction (age and years of schooling completed) | | B coefficient | T value |
|---|---|---|---|
| Age: | Years of schooling completed: | | |
| 65 and over... | 5 to 8..... | -.0873 | - 2.9 |
| 65 and over... | 9 to 11..... | -.0823 | - 2.4 |
| 65 and over... | 12 to 15..... | -.1283 | - 4.1 |
| 65 and over... | 16 and over..... | -.1486 | - 3.4 |

$R^2$ = .185 N = 25,143
Mean of DV = .405 SEE = .444
Probability of making a correct prediction = .686

Table F-6. Labor force participation regression of women, age 22 and over living in largest 96 SMSA's
[Dependent variable: In or out of the labor force during 1966]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .4568 | 15.4 |
| Marital status: | | |
| Married, spouse present | --- | --- |
| Married, other | .1523 | 13.8 |
| Never married | .2915 | 22.0 |
| Age: | | |
| 22 to 54 | --- | --- |
| 55 to 64 | -.0594 | - 5.7 |
| 65 and over | -.2753 | - 9.0 |
| Years of schooling: | | |
| 0 to 4 | --- | --- |
| 5 to 8 | .1255 | 5.8 |
| 9 to 11 | .1704 | 7.9 |
| 12 to 15 | .2231 | 10.6 |
| 16 and over | .3061 | 13.3 |
| Unemployment rate (1966): (in percent) | | |
| Under 2.5 | --- | --- |
| 2.5 to 3.4 | -.0213 | - 1.6 |
| 3.5 to 4.0 | -.0269 | - 2.0 |
| 4.1 to 5.0 | -.0291 | - 2.2 |
| 5.1 and over | -.0311 | - 2.4 |
| Employment change (1965-66) (in percent) | | |
| Under 3.5 | --- | --- |
| 3.5 to 6.49 | .0301 | 3.9 |
| 6.5 and over | .0529 | 5.1 |
| Relative employment opportunities: (in percent) | | |
| Under 62 | --- | --- |
| 62 to 73.9 | .0381 | 3.2 |
| 74 and over | .0571 | 3.2 |
| FILOW: (In dollars) | | |
| Less than $1,500, or negative | --- | --- |
| 1,500 to 7,499 | -.1451 | -15.4 |
| 7,500 and over | -.2455 | -24.4 |
| (Interaction (Marital status and age) | | |
| Marital status: Age: | | |
| Other 55 to 64 | -.0406 | - 2.1 |
| Other 65 and over | -.1391 | - 7.4 |
| Never married 55 to 64 | -.1104 | - 3.3 |
| Never married 65 and over | -.2045 | - 6.4 |

Table F-6. Labor force participation regression of women, age 22 and over living in largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force during 1966]

| Interaction (age and years of schooling completed) | | B coefficient | T value |
|---|---|---|---|
| Age: | Years of schooling: | | |
| 65 and over..... | 5 to 8..... | -.0885 | - 2.8 |
| 65 and over..... | 9 to 11..... | -.0848 | - 2.4 |
| 65 and over..... | 12 to 15..... | -.1288 | - 4.0 |
| 65 and over..... | 16 and over..... | -.1628 | - 3.6 |

$R^2$ = .175 N = 25,143
Mean of DV = .478 SEE = .454
Probability of making a correct prediction = .653

Table F-7. Labor force participation regression of women, age 22 and over, married, spouse present, living in largest 96 SMSA's
[Dependent variable: in or out of the labor force during March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .4779 | 12.9 |
| Age: | | |
| 22 to 34 | -- | -- |
| 35 to 54 | -.0454 | - 4.7 |
| 55 to 64 | -.2143 | -15.3 |
| 65 and over | -.4372 | - 9.4 |
| Years of schooling completed: | | |
| 0 to 4 | -- | -- |
| 5 to 8 | .0321 | 1.1 |
| 9 to 11 | .0826 | 2.9 |
| 12 to 15 | .1381 | 5.0 |
| 16 and over | .3304 | 9.8 |
| Age of youngest child: | | |
| No children | -- | -- |
| Under 3 | -.3667 | -27.3 |
| 3 to 5 | -.2906 | -20.1 |
| 6 to 17 | -.0894 | - 8.7 |
| Race: | | |
| White | -- | -- |
| Negro and other | .0906 | 4.9 |
| Relative employment opportunities (1966): (in percent) | | |
| Under 62 | -- | -- |
| 62 to 73.9 | .0548 | 4.0 |
| 74 and over | .0920 | 4.7 |
| Employment change (1965-66): (in percent) | | |
| Under 3.5 | -- | -- |
| 3.5 to 6.49 | .0356 | 4.1 |
| 6.5 and over | .0608 | 5.2 |
| FILOW: (in dollars) | | |
| Less than $1,500 or negative | -- | -- |
| 1,500 to 7,499 | -.0777 | - 3.9 |
| 7,500 and over | -.1678 | - 8.2 |
| **Interaction (Age and years of schooling)** | | |
| Age: / Years of schooling: | | |
| 65 and over.. 5 to 8 | -.0308 | - .6 |
| 65 and over.. 9 to 11 | .0064 | .1 |
| 65 and over.. 12 t 15 | -.1008 | - 2.0 |
| 65 and over.. 16 and over | -.2438 | - 3.2 |
| **Interaction (Years of schooling and age of children)** | | |
| Years of schooling. / Youngest child: | | |
| 16 and over.. Under 3 | -.1674 | - 4.9 |
| 16 and over.. 3 to 5 | -.1146 | - 2.7 |
| 16 and over.. 6 to 17 | -.1657 | - 5.4 |

Table F-7. Labor force participation regression of women, age 22 and over, married, spouse present, living in largest 96 SMSA's--Continued
[Dependent variable: in or out of the labor force during March 1967]

| Interaction (age of children and race) | | B coefficient | T value |
|---|---|---|---|
| Youngest child: | Race: | | |
| Under 3 years.. | Negro and other.. | .0587 | 1.8 |
| 3 to 5 years... | Negro and other.. | .1401 | 3.9 |
| 6 to 17 years.. | Negro and other.. | .0541 | 1.8 |

$R^2$ = .126 N = 17,131
Mean of DV = .359 SEE = .449
Probability of making a correct prediction = .677

Table F-8. Labor force participation regression of women 22 and over, married, spouse present, living in the largest 96 SMSA's who worked one or more weeks during 1966
[Dependent variable: Number of hours supplied during 1966]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | 1491.15 | 15.7 |
| Age: | | |
| 22 to 34 | --- | --- |
| 35 to 54 | 58.41 | 2.7 |
| 55 to 64 | - 27.39 | - .9 |
| 65 and over | - 747.11 | - 2.9 |
| Years of schooling completed: | | |
| 0 to 4 | --- | --- |
| 5 to 8 | 36.50 | .5 |
| 9 to 11 | 86.08 | 1.1 |
| 12 to 15 | 135.39 | 1.8 |
| 16 and over | 184.98 | 2.2 |
| Youngest child: | | |
| No children | --- | --- |
| Under 3 | - 677.11 | -19.8 |
| 3 to 5 | - 498.52 | -14.1 |
| 6 to 17 | - 273.21 | -11.8 |
| Race: | | |
| Negro and other | - 106.97 | - 2.7 |
| Relative employment opportunities (1966): (in percent) | | |
| Under 62 | --- | --- |
| 62 to 73.9 | 127.18 | 3.6 |
| 74 and over | 248.85 | 5.2 |
| Employment change (1965-66): (in percent) | | |
| Below 3.5 | --- | --- |
| 3.5 to 6.49 | - 4.36 | - .2 |
| 6.5 and over | 48.93 | 1.7 |
| FILOW: (In dollars) | | |
| Less than $1,500, or negative | --- | --- |
| 1,500 to 7,499 | - 104.75 | - 2.3 |
| 7,500 and over | - 201.15 | - 4.4 |
| Interaction (Age and years of schooling) | | |
| Age: Years of schooling: | | |
| 65 and over 5 to 8 | 361.16 | 1.3 |
| 65 and over 9 to 11 | 349.39 | 1.2 |
| 65 and over 12 to 15 | 403.61 | 1.5 |
| 65 and over 16 and over | 680.21 | 2.0 |
| Interaction (Years of schooling completed and age of children) | | |
| Years of schooling: Youngest child: | | |
| 16 and over Under 3 | - 51.30 | - .7 |
| 16 and over 3 to 5 | - 24.36 | - .3 |
| 16 and over 6 to 17 | 41.25 | .6 |

Table F-8. Labor force participation regression of women 22 and over, married, spouse present, living in the largest 96 SMSA's who worked one or more weeks during 1966--Continued
[Dependent variable: Number of hours supplied during 1966]

| Interaction (age of children and race) | | B coefficient | T value |
|---|---|---|---|
| Youngest child: | Race: | | |
| Under 3..... | Negro and other... | 308.48 | 4.2 |
| 3 to 5..... | Negro and other... | 415.97 | 5.3 |
| 6 to 17..... | Negro and other... | 337.03 | 5.4 |

$R^2$ = .103
Mean of DV = 1399.26

N = 7,561
SEE = 727.18

Table F-9. Labor force participation regression of women 22 and over, married, spouse present, who worked one or more weeks during 1966
[Dependent variable: Number of hours supplied during 1966]

| Independent variable | | B coefficient | T value |
|---|---|---|---|
| Constant | | 1250.49 | 26.2 |
| Age: | | | |
| 22 to 34 | | --- | --- |
| 35 to 54 | | 67.55 | 3.8 |
| 55 to 64 | | - 23.59 | - .9 |
| 65 and over | | - 373.93 | - 2.7 |
| Wage level: | | | |
| Low wage | | --- | --- |
| Medium-low wage | | 249.62 | 6.4 |
| Medium wage | | 435.17 | 12.2 |
| Medium-high wage | | 578.01 | 15.8 |
| High wage | | 537.24 | 13.8 |
| Youngest child: | | | |
| No children | | --- | --- |
| Under 3 | | - 619.09 | -23.9 |
| 3 to 5, no children 6 to 17 | | - 386.11 | - 8.6 |
| 3 to 5, with some children 6 to 17 | | - 436.87 | -14.8 |
| 6 to 17, no children under 6 | | - 205.26 | -11.5 |
| Race: | | | |
| White | | --- | --- |
| Negro and other | | - 21.31 | - .6 |
| FILOW: (In dollars) | | | |
| Less than $1,500, or negative | | --- | --- |
| 1,500 to 2,999 | | - 98.50 | - 2.6 |
| 3,000 to 4,999 | | - 57.65 | - 1.7 |
| 5,000 to 7,499 | | - 118.95 | - 3.7 |
| 7,500 and over | | - 239.10 | - 7.5 |
| Interaction (Age and skill) | | | |
| Age: | Wage level: | | |
| 65 and over | Low wage | --- | --- |
| 65 and over | Medium-low wage | - 28.50 | - .2 |
| 65 and over | Medium wage | - 212.93 | - 1.3 |
| 65 and over | Medium-high wage | 91.29 | .6 |
| 65 and over | High wage | - 9.29 | - .1 |
| Interaction (Age of children and race) | | | |
| Age of children: | Race: | | |
| None | Negro and other | --- | --- |
| Under 5 | Negro and other | 243.54 | 3.8 |
| 3 to 5 | Negro and other | 466.61 | 3.7 |
| 3 to 5 and 6 to 17 | Negro and other | 283.84 | 3.7 |
| 6 to 17 only | Negro and other | 205.28 | 3.9 |

$R^2$ = .090 N = 14,778
Mean of DV = 1396.35 SEE = 822.35

Table F-10. Labor force participation regression of all women 22 and over, married, spouse present
[Dependent variable: In or out of the labor force during March 1967]

| Independent variable | | B coefficient | T value |
|---|---|---|---|
| Constant | | .6008 | 26.3 |
| Age: | | | |
| 22 to 34 | | --- | --- |
| 35 to 54 | | -.0527 | - 7.0 |
| 55 to 64 | | -.1993 | -17.4 |
| 65 and over | | -.3503 | -13.3 |
| Years of schooling completed: | | | |
| 0 to 7 | | --- | --- |
| 8 to 11 | | .0459 | 7.5 |
| 12 to 15 | | .1005 | 9.9 |
| 16 and over | | .3239 | 17.3 |
| Age at first marriage: | | | |
| Under 18 | | --- | --- |
| 18 to 19 | | -.0261 | - 3.0 |
| 20 and over | | -.0343 | - 4.5 |
| Age of children: | | | |
| No children | | --- | --- |
| Under 3 | | -.3352 | -33.8 |
| 3 to 5 | | -.2307 | -12.8 |
| 3 to 5 with some 6 to 17 | | -.2458 | -22.6 |
| 6 to 17 only | | -.0712 | - 9.5 |
| Husband's employment status: | | | |
| Unemployed | | --- | --- |
| Not in the labor force | | .0301 | .8 |
| Employed | | -.0802 | - 4.1 |
| **Interaction (Age and husband's employment status)** | | | |
| Age: | Husband's employment status: | | |
| 22 to 34 | Not in the labor force | --- | --- |
| 35 to 54 | Not in the labor force | -.1380 | - 3.6 |
| 55 to 64 | Not in the labor force | -.2080 | - 5.5 |
| 65 and over | Not in the labor force | -.2307 | - 5.8 |
| **Interaction (Age and years of schooling completed)** | | | |
| Age: | Years of schooling: | | |
| 65 and over | 0 to 7 | --- | --- |
| 65 and over | 8 to 11 | -.0303 | - 1.3 |
| 65 and over | 12 to 15 | -.0737 | - 2.8 |
| 65 and over | 16 and over | -.2420 | - 5.1 |
| **Interaction (Years of schooling completed and youngest child)** | | | |
| Years of schooling: | Youngest child: | | |
| 16 and over | None | --- | --- |
| 16 and over | Under 3 | -.2030 | - 7.4 |
| 16 and over | 3 to 5 | -.0630 | - 1.2 |
| 16 and over | 3 to 17, 3 to 5, some 6-17 | -.1930 | - 5.1 |
| 16 and over | 6 to 17 only | -.1696 | - 6.8 |

$R^2$ = .105 Mean of DV = .373 N = 31,157 SEE = .458
Probability of making correct prediction = .655

## Appendix G

Table G-1. Labor force regression of youth (16-21) in school, children or other relatives of the family head, living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .1945 | 5.1 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0318 | 2.1 |
| 20 to 21 | -.0362 | - 1.7 |
| Race: | | |
| White | --- | --- |
| Negro | -.0883 | - 3.5 |
| Sex: | | |
| Male | --- | --- |
| Female | -.0959 | - 7.0 |
| Unemployment rate (1966): (in percent) | | |
| 0 to 2.5 | --- | --- |
| 2.5 to 3.4 | -.0139 | - .5 |
| 3.5 to 4.0 | -.0245 | - .8 |
| 4.1 to 5.0 | -.0086 | - .3 |
| 5.1 and over | .0566 | 1.9 |
| Employment change (1965-66· (in percent) | | |
| Under 3.5 | --- | --- |
| 3.5 to 5.49 | .1022 | 5.3 |
| 5.5 to 6.49 | .1167 | 5.5 |
| 6.5 and over | .1165 | 3.8 |
| Relative opportunities (1966): (in percent) | | |
| Under 72.0 | --- | --- |
| 72.0 to 89.9 | .0815 | 3.0 |
| 90.0 and over | .1931 | 4.9 |
| Residence: | | |
| Not in poverty tract | --- | --- |
| Poverty tract | .0035 | .2 |
| Weeks unemployed of head: | | |
| None | --- | --- |
| 1 to 4 | .0643 | .8 |
| 5 to 10 | .1269 | 1.2 |
| 11 and over | .0311 | .3 |

$R^2$ = .038 N = 4542
Mean of DV = .328 SEE = .4615
Probability of correct prediction = .673

Table G-2. Labor force participation regression of youth (16-21) out of school, children or other relatives of the family head, living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .6437 | 13.0 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .2142 | 8.4 |
| 20 to 21 | .2363 | 8.9 |
| Race: | | |
| White | --- | --- |
| Negro | -.0642 | - 2.4 |
| Sex: | | |
| Male | --- | --- |
| Female | -.0549 | - 3.2 |
| Unemployment rate (1966): (in percent) | | |
| 0 to 2.5 | --- | --- |
| 2.5 to 3.4 | -.0197 | - .5 |
| 3.5 to 4.0 | .0029 | .1 |
| 4.1 to 5.0 | .0026 | .1 |
| 5.1 and over | -.0745 | - 1.9 |
| Employment change (1965-66): (in percent) | | |
| Less than 3.5 | --- | --- |
| 3.5 to 5.49 | .0045 | .2 |
| 5.5 to 6.49 | .0139 | .5 |
| 6.5 and over | -.0532 | - 1.4 |
| Relative opportunities (1966): (in percent) | | |
| Under 72.0 | --- | --- |
| 72.0 to 89.9 | .0843 | 2.6 |
| 90.0 and over | .1144 | 2.7 |
| Residence: | | |
| Not in poverty tract | --- | --- |
| Poverty tract | -.0497 | - 2.1 |
| Weeks unemployed of head: | | |
| None | --- | --- |
| 1 to 4 | .0895 | - 1.2 |
| 5 to 10 | -.0735 | - .7 |
| 11 and over | -.0413 | - .5 |

$R^2$ = .086 N = 1678
Mean of DV = .8486 SEE = .344
Probability of correct prediction = .8488

Table G-3. Labor force participation regression of youth (16-21) in school, children or other relatives of the family head, living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .1975 | 5.2 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0317 | 2.1 |
| 20 to 21 | -.0371 | - 1.7 |
| Race: | | |
| White | --- | --- |
| Negro | -.0940 | - 3.6 |
| Sex: | | |
| Male | --- | --- |
| Female | -.0968 | - 7.0 |
| Unemployment rate: (in percent) | | |
| 0 to 2.5 | --- | --- |
| 2.5 to 3.4 | -.0128 | - .4 |
| 3.5 to 4.0 | .0249 | .8 |
| 4.1 to 5.0 | -.0069 | - .2 |
| 5.1 and over | .0562 | 1.9 |
| Employment change (1966): (in percent) | | |
| Less than 35.0 | --- | --- |
| 35.0 to 54.9 | .1027 | 5.3 |
| 55.0 to 64.9 | .1163 | 5.5 |
| 65.0 and over | .1083 | 3.3 |
| Relative opportunities (1966): (in percent) | | |
| Less than 72.0 | --- | --- |
| 72.0 to 89.9 | .0801 | 2.9 |
| 90.0 and over | .1625 | 4.5 |
| Residence: | | |
| Not in poverty tract | --- | --- |
| Poverty tract | -.0053 | - .2 |
| Weeks unemployed of head: | | |
| None | --- | --- |
| 1 to 4 | .1026 | 1.2 |
| 5 to 10 | .0636 | .5 |
| 11 and over | -.0547 | - .5 |

Table G-3. Labor force participation regression of youth (16-21) in school, children or other relatives of the family head, living in largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| Relative opportunities: (in percent) | | | |
| 90.0 and over in poverty tracts... | | .0369 | .4 |
| 90.0 and over for Negroes..... | | .1669 | 1.2 |
| Employment change: (in percent) | | | |
| 65.0 and over in poverty tracts... | | .0968 | 1.1 |
| 65.0 and over for Negroes..... | | -.0632 | - .5 |
| Weeks unemployed of head: | | | |
| 1 to 4 weeks | Negro..... | .1365 | .5 |
| 5 to 10 weeks | Negro..... | .1391 | .4 |
| 11 and over | Negro..... | .5544 | 2.0 |
| 1 to 4 weeks | Poverty tract... | -.2822 | - 1.1 |
| 5 to 10 weeks | Poverty tract... | .0630 | .2 |
| 11 and over | Poverty tract... | -.0300 | - .1 |

$R^2$ = .04 N = 4542
Mean of DV = .33 SEE = .461
Probability of correct prediction = .67

Table G-4. Labor force participation regression of youth (16-21) out of school, children or other relatives of the family head, living in largest 96 SMSA's
[Dependent variable: In and out of the labor force in March 1967]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | .6421 | 12.9 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .2114 | 8.3 |
| 20 to 21 | .2334 | 8.7 |
| Race: | | |
| White | --- | --- |
| Negro | -.0615 | - 2.1 |
| Sex: | | |
| Male | --- | --- |
| Female | -.0524 | - 3.1 |
| Unemployment rate: (in percent) | | |
| 0 to 2.4 | --- | --- |
| 2.5 to 3.4 | -.0171 | - .5 |
| 3.5 to 4.0 | .0032 | .1 |
| 4.1 to 5.0 | .0030 | .1 |
| 5.1 and over | -.0738 | - 1.9 |
| Employment change (1965-66): (in percent) | | |
| Less than 35.0 | --- | --- |
| 35.0 to 54.9 | .0044 | .2 |
| 55.0 to 64.9 | .0134 | .5 |
| 65.0 and over | -.0657 | - 1.6 |
| Relative opportunities (1966): (in percent) | | |
| Less than 72.0 | --- | --- |
| 72.0 to 89.9 | .0852 | 2.6 |
| 90.0 and over | .1215 | 2.7 |
| Residence: | | |
| Not in poverty tract | --- | --- |
| Poverty tract | -.0467 | - 1.8 |
| Weeks unemployed of head: | | |
| None | --- | --- |
| 1 to 4 | -.0822 | - .9 |
| 5 to 10 | -.0119 | - .1 |
| 11 and over | -.0162 | - .2 |

Table G-4. Labor force participation regression of youth (16-21) out of school, children or other relatives of the family head, living in largest 96 SMSA's--Continued

[Dependent variable: In and out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| Relative opportunities: (in percent) | | | |
| 90.0 and over in poverty tract... | | -.0026 | 0.0 |
| 90.0 and over for Negroes..... | | -.1837 | - 1.1 |
| Employment change: (in percent) | | | |
| 65.0 and over in poverty tract... | | .0299 | .3 |
| 65.0 and over for Negroes..... | | .0709 | .6 |
| Weeks unemployed of head: | | | |
| 1 to 4 weeks | Negro..... | .0000 | 0.0 |
| 5 to 10 weeks | Negro..... | .3297 | .9 |
| 11 and over | Negro..... | .0372 | .2 |
| 1 to 4 weeks | Poverty tract.. | -.0295 | - .2 |
| 5 to 10 weeks | Poverty tract.. | -.8764 | - 2.1 |
| 11 and over | Poverty tract.. | -.1447 | - .6 |

$R^2$ = .091 N = 1678

Mean of DV = .85 SEE = .345

Probability of correct prediction = .85

Table G-5. Labor force participation regression of all youth (16-21) in school
[Dependent variable: in or out of the labor force in March 1967]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | .1987 | 4.9 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0321 | 3.1 |
| 20 to 21 | -.0088 | - .6 |
| Race: | | |
| White | --- | --- |
| Negro | -.1119 | - 6.6 |
| Sex: | | |
| Male | --- | --- |
| Female | -.1087 | - 1.8 |
| Residence: | | |
| Not in poverty tract | --- | --- |
| Poverty tract | .0442 | - 3.4 |
| FILOW: | | |
| Under $3,000, or negative | --- | --- |
| 3,000-4,999 | -.0306 | - 1.6 |
| 5,000-6,999 | -.0383 | - 2.0 |
| 7,000-9,999 | -.0496 | - 2.8 |
| 10,000-14,999 | -.0454 | - 2.5 |
| 15,000 and over | -.0643 | - 3.3 |
| Number of family members: | | |
| 1 to 3 | --- | --- |
| 4 to 6 | .0330 | 2.8 |
| 7 or more | .0815 | 5.4 |
| Marital status: | | |
| Not married | --- | --- |
| Married | -.0077 | - .1 |
| Residence: | | |
| Nonfarm | --- | --- |
| Farm | .0272 | 1.5 |
| Years of schooling completed: | | |
| Less than 9 school years | --- | --- |
| 9 or more school years | .2004 | 5.2 |
| Interactions: | | |
| Female and married | -.0536 | - .7 |
| Negro and married | .0700 | .7 |
| Negro and farm residence | -.1652 | - 3.2 |

$R^2$ = .19 N = 8575
Mean of DV = .32 SEE = .42
Probability of correct prediction = .86

Table G-6. Labor force participation regression of all youth (16-21) out of school
[Dependent variable: In or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .6334 | 26.7 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .1946 | 11.9 |
| 20 to 21 | .2322 | 14.0 |
| Race: | | |
| White | --- | --- |
| Negro | -.0420 | - 2.1 |
| Sex: | | |
| Male | --- | --- |
| Female | -.0921 | - 7.[illegible] |
| Residence: | | |
| Not in poverty tract | --- | --- |
| Poverty tract | -.0339 | - 2.[illegible] |
| FILOW: | | |
| Less than $3,000, or negative | --- | --- |
| 3,000 to 4,999 | -.0022 | - .1 |
| 5,000 to 6,999 | -.0030 | - .2 |
| 7,000 to 9,999 | -.0162 | - 1.0 |
| 10,000 to 14,999 | .0219 | 1.2 |
| 15,000 and over | .0010 | .0 |
| Number of family members: | | |
| 1 to 3 | --- | --- |
| 4 to 6 | -.0498 | - 4.1 |
| 7 and over | -.0478 | - 2.8 |
| Marital status: | | |
| Not married | --- | --- |
| Married | .0366 | 1.8 |
| Residence: | | |
| Nonfarm | --- | --- |
| Farm | -.0438 | - 1.8 |
| Years of schooling completed: | | |
| Less than 9 school years | --- | --- |
| 9 or more school years | .1362 | 7.7 |
| Interactions: | | |
| Female and married | -.4896 | -21.1 |
| Negro and married | .0770 | 2.5 |
| Negro and farm residence | .0300 | .5 |

$R^2$ = .34 N = 5569
Mean of DV = .71 SEE = .366
Probability of correct prediction = .74

Table G-7. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | .5867 | 16.1 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0793 | 4.6 |
| 20 to 21 | .0281 | 1.4 |
| Race: | | |
| White | --- | --- |
| Negro | -.0610 | - 3.6 |
| Sex: | | |
| Male | --- | --- |
| Female | -.1557 | -14.3 |
| Relative opportunities (1966): (in percent) | | |
| Less than 72.0 | --- | --- |
| 72.0 to 89.9 | .1105 | 5.3 |
| 90.0 and over | .1648 | 5.9 |
| Unemployment rate: (in percent) | | |
| 0 to 2.4 | --- | --- |
| 2.5 to 3.4 | -.0139 | - .6 |
| 3.5 to 4.0 | .0111 | - .5 |
| 4.1 to 5.0 | -.0260 | - 1.2 |
| 5.1 and over | .0118 | .5 |
| FILOW: | | |
| Under $3,000 and negative | --- | --- |
| 3,000 to 5,999 | -.0271 | - 1.3 |
| 6,000 to 9,999 | -.0085 | - .4 |
| 10,000 and over | .0200 | 1.0 |
| Family status: | | |
| Nonhead | --- | --- |
| Head | .1358 | 5.5 |
| High school status: | | |
| Nongraduate | --- | --- |
| Graduate | .1631 | 9.3 |
| Major activity: | | |
| Other than school | --- | --- |
| School | -.2891 | 15.5 |

Table G-7. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force in March 1967]

| Interactions | | | B coefficient | T value |
|---|---|---|---|---|
| High school status | Major activity | Relative opportunity (in percent) | | |
| Graduate | In school | 72.0 to 89.9.... | -.2445 | -10.0 |
| Graduate | In school | 90.0 and over... | -.2082 | - 4.8 |
| High school status | Major activity | Family status | | |
| Graduate | In school | Head..... | .0103 | .1 |

$R^2$ = .143
Mean of DV = .495
Probability of correct prediction = .689

N = 7665
SEE = .46

Table G-8. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | .7040 | 16.6 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0155 | 1.0 |
| 20 to 21 | -.0402 | - 2.1 |
| Race: | | |
| White | --- | --- |
| Negro | -.0135 | - .2 |
| Sex: | | |
| Male | --- | --- |
| Female | -.1494 | -14.1 |
| Relative opportunities (1966): (in percent) | | |
| Less than 72.0 | --- | --- |
| 72.0 to 89.9 | .1006 | 2.9 |
| 90.0 and over | .1158 | 2.6 |
| Unemployment rate: (in percent) | | |
| 0 to 2.4 | --- | --- |
| 2.5 to 3.4 | -.0210 | - 1.0 |
| 3.5 to 4.0 | -.0126 | - .6 |
| 4.1 to 5.0 | -.0323 | - 1.5 |
| 5.1 and over | .0046 | .2 |
| FILCW: | | |
| Less than $3,000, or negative | --- | --- |
| 3,000 to 5,999 | -.0125 | - .5 |
| 6,000 to 9,999 | .0124 | .6 |
| 10,000 and over | .0306 | 1.4 |
| Family status: | | |
| Nonhead | --- | --- |
| Head | .2880 | 4.1 |
| High school status: | | |
| Nongraduate | --- | --- |
| Graduate | .0697 | 4.8 |
| Major activity: | | |
| Other than school | --- | --- |
| In school | -.4033 | - 9.9 |

Table G-8. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| Relative opportunity and race: | | | |
| 72.0 to 89.0 | Negro..... | -.0195 | - .4 |
| 90.0 and over | Negro..... | .0343 | .3 |
| Unemployment rate and race: | | | |
| 4.1 to 5.0 | Negro..... | .0034 | .1 |
| 5.1 and over | Negro..... | .0207 | .5 |
| FILOW and race: | | | |
| $ 3,000 to [illegible],999 | Negro..... | -.0454 | - 1.0 |
| 6,000 to 9,999 | Negro..... | -.0310 | - 1.8 |
| 10,000 and over | Negro..... | -.0075 | - .1 |
| Relative opportunity and family status: | | | |
| 72.0 to 89.9 | Head..... | -.1423 | - 2.0 |
| 90.0 and over | Head..... | -.1875 | - 2.2 |
| Relative opportunity and major activity: | | | |
| 72.0 to 89.9 | In school..... | -.0254 | - .6 |
| 90.0 and over | In school..... | .0547 | 1.0 |

$R^2$ = .184 N = 7665
Mean of DV = .495 SEE = .452
Probability of correct prediction = .689

Table G-9. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .7161 | 19.0 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0280 | 1.7 |
| 20 to 21 | -.0280 | - 1.4 |
| Race: | | |
| White | --- | --- |
| Negro | -.0660 | - 4.0 |
| Sex: | | |
| Male | --- | --- |
| Female | -.1443 | -13.7 |
| Relative opportunities (1966): (in percent) | | |
| Less than 72.0 | --- | --- |
| 72.0 to 89.9 | .0676 | 3.4 |
| 90.0 and over | .1312 | 5.2 |
| Unemployment rate: (in percent) | | |
| 0 to 2.4 | --- | --- |
| 2.5 to 3.4 | -.0171 | - .8 |
| 3.5 to 4.0 | -.0122 | - .5 |
| 4.1 to 5.0 | -.0219 | - .7 |
| 5.1 and over | -.1063 | - 3.1 |
| FILOW: | | |
| Under $2,000, or negative | --- | --- |
| 3,000 to 5,999 | -.0236 | - .8 |
| 6,000 to 9,999 | .0262 | .9 |
| 10,000 and over | .1200 | 3.9 |
| Family status: | | |
| Nonhead | --- | --- |
| Head | .1488 | 3.3 |
| High school status: | | |
| Nongraduate | --- | --- |
| Graduate | .0272 | 1.4 |
| Major activity: | | |
| Not in school | --- | --- |
| In school | -.3628 | - 9.5 |

Table G-9. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| Family status and school status: | | | |
| Head | High school graduate..... | .0512 | 1.3 |
| Head | In school..... | -.1110 | - 1.7 |
| FILOW and major activity: | | | |
| $ 3,000 to $5,999 | In school..... | .0043 | .1 |
| 6,000 to 9,999 | In school..... | -.0490 | - 1.2 |
| 10,000 and over | In school..... | -.1423 | - 3.5 |
| FILOW and family status: | | | |
| $ 3,000 to $5,999 | Head..... | .0281 | .4 |
| 6,000 to 9,999 | Head..... | -.1775 | - 2.2 |
| 10,000 and over | Head..... | -.1974 | - 1.7 |
| Unemployment rate and major activity: | | | |
| 4.1 to 5 | In school..... | -.0595 | - 2.2 |
| 5.1 and over | In school..... | .1361 | 4.5 |
| Unemployment rate and school status: | | | |
| 4.1 to 5 | High school graduate..... | .0653 | 2.6 |
| 5.1 and over | High school graduate..... | .0491 | 1.7 |
| Unemployment rate and family status: | | | |
| 4.1 to 5 | Head..... | .0025 | .1 |
| 5.1 and over | Head..... | .0944 | 1.9 |

$R^2$ = .20
Mean of DV = .495
Probability of correct prediction = .69
N = 7665
SEE = .448

Table G-10. Labor force participation regression of all youth (16-21) living in the largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | .7720 | 22.5 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0282 | 1.8 |
| 20 to 21 | -.0269 | - 1.4 |
| Race: | | |
| White | --- | --- |
| Negro | -.0730 | - 4.5 |
| Sex: | | |
| Male | --- | --- |
| Female | -.1440 | -13.8 |
| Unemployment rate: (in percent) | | |
| 0 to 2.5 | --- | --- |
| 2.5 to 3.4 | .0051 | .3 |
| 3.5 to 4.0 | -.0086 | - .4 |
| 4.1 to 5.0 | -.0148 | - .5 |
| 5.1 and over | -.0996 | - 2.9 |
| FILOW: | | |
| Less than $3,000, or negative | --- | --- |
| 3,000 to 5,999 | -.0219 | - .7 |
| 6,000 to 9,999 | .0281 | 1.0 |
| 10,000 and over | .1260 | 4.1 |
| Family status: | | |
| Nonhead | --- | --- |
| Head | .1529 | 3.4 |
| High school status: | | |
| Nongraduate | --- | --- |
| Graduate | .0289 | 1.6 |
| Major activity: | | |
| Not in school | --- | --- |
| In school | -.3598 | - 9.5 |

Table G-10. Labor force participation regression of all youth (16-21) living in the largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| **Family status and school status:** | | | |
| Head | High school graduate..... | .0532 | 1.4 |
| Head | In school..... | -.0996 | - 1.6 |
| **FILOW and major activity:** | | | |
| $ 3,000 to $6,000 | In school..... | .0046 | .1 |
| 6,000 to 9,999 | In school..... | -.0486 | - 1.2 |
| 10,000 and over | In school..... | -.1447 | - 3.5 |
| **FILOW and family status:** | | | |
| $ 3,000 to $5,999 | Head..... | .0298 | .5 |
| 6,000 to 9,999 | Head..... | -.1756 | - 2.2 |
| 10,000 and over | Head..... | -.2082 | - 1.9 |
| **Unemployment rate and major activity:** | | | |
| 4.1 to 5 | In school..... | -.0638 | - 2.4 |
| 5.1 and over | In school..... | .1347 | 4.5 |
| **Unemployment rate and school status:** | | | |
| 4.1 to 5 | High school graduate..... | .0618 | 2.5 |
| 5.1 and over | High school graduate..... | .0477 | 1.7 |
| **Unemployment rate and family status:** | | | |
| 4.1 to 5 | Head..... | -.0049 | - .1 |
| 5.1 and over | Head..... | .0872 | 1.8 |

$R^2$ = .219 N = 7665
Mean of DV = .495 SEE = .443
Probability of correct prediction = .703

Table G-11. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in 1966]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | .8483 | 22.3 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .2350 | 19.1 |
| 20 to 21 | .2784 | 18.9 |
| Race: | | |
| White | --- | --- |
| Negro | -.1169 | - 7.5 |
| Sex: | | |
| Male | --- | --- |
| Female | -.1632 | - 6.5 |
| FILOW: | | |
| Less than $3,000, or negative | --- | --- |
| 3,000 to 4,999 | -.0236 | - .7 |
| 5,000 to 6,999 | -.0943 | - 2.8 |
| 7,000 to 9,999 | -.0827 | - 2.6 |
| 10,000 to 14,999 | -.0637 | - 1.9 |
| 15,000 and over | -.0847 | - 2.1 |
| Family status: | | |
| Child, other relative of head | --- | --- |
| Wife or head | -.0938 | - 5.2 |
| Number of family members: | | |
| 1 to 3 | --- | --- |
| 4 to 6 | -.0270 | - 2.2 |
| 7 and over | -.0001 | - .0 |
| Unemployment rate: (in percent) | | |
| 0 to 2 | --- | --- |
| 2.5 to 3. | -.0207 | - .6 |
| 3.5 to 4.0 | -.0424 | - 1.3 |
| 4.1 to 5.0 | -.0625 | - 2.0 |
| 5.1 and over | -.1157 | - 3.5 |
| Major activity: | | |
| Other than school | --- | --- |
| In school | -.2412 | - 5.3 |

Table G-11. Labor force participation regression of all youth (16-21) living in largest 96 SMSA's--Continued
[Dependent variable: In or out of the labor force in 1966]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| FILOW and major activity: | | | |
| $ 3,000 to $ 4,999 | In school..... | .0172 | .4 |
| 5,000 to 6,999 | In school..... | .0647 | 1.7 |
| 7,000 to 9,999 | In school..... | .0915 | 2.5 |
| 10,000 to 14,999 | In school..... | .0485 | 1.3 |
| 15,000 and over | In school..... | .1395 | 3.2 |
| Unemployment rate and major activity: | | | |
| 2.5 to 3.4 | In school..... | .0503 | 1.2 |
| 3.5 to 4.0 | In school..... | .0811 | 1.9 |
| 4.1 to 5.0 | In school..... | -.0102 | - .3 |
| 5.1 and over | In school..... | .0918 | 2.2 |
| FILOW and sex: | | | |
| $ 3,000 to $ 4,999 | Female..... | -.0594 | - 1.5 |
| 5,000 to 6,999 | Female..... | .0258 | .7 |
| 7,000 to 9,999 | Female..... | .0100 | .3 |
| 10,000 to 14,999 | Female..... | .0569 | 1.8 |
| 15,000 and over | Female..... | .0379 | 1.1 |

$R^2$ = .157 N = 7665
Mean of DV = .688 SEE = .426
Probability of correct prediction = .720

Table G-12. Labor force participation regression of youth, 16-21, children or other relatives of head, living in largest 96 SMSA's
[Dependent variable: In or out of the labor force in March 1967]

| Independent variable | B coefficient | T value |
|---|---|---|
| Constant | .6674 | 10.0 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | .0594 | 4.4 |
| 20 to 21 | .0486 | 2.8 |
| Race: | | |
| White | --- | --- |
| Negro | -.0978 | - 5.4 |
| Sex: | | |
| Male | --- | --- |
| Female | -.0591 | - 3.2 |
| Unemployment rate: (in percent) | | |
| 0 to 2.5 | --- | --- |
| 2.5 to 3.4 | .0165 | .7 |
| 3.5 to 4.0 | .0341 | 1.4 |
| 4.1 to 5.0 | .0264 | .9 |
| 5.1 and over | .0967 | 3.0 |
| Employment change (1965-66): (in percent) | | |
| Less than 3.50 | --- | --- |
| 3.50 to 5.49 | .0813 | 4.9 |
| 5.50 to 6.49 | .1178 | 4.3 |
| 6.50 and over | .0766 | 1.8 |
| Major activity: | | |
| Other than school | --- | --- |
| School | -.3404 | - 4.3 |
| Employment status of family head: | | |
| Unemployed | --- | --- |
| Not in the labor force | .0684 | 1.0 |
| Employed | .0990 | 1.6 |
| Welfare recipient status: | | |
| Nonrecipient | --- | --- |
| Recipient | -.0084 | - .2 |

Table G-12. Labor force participation regression of youth, 16-21, children or other relatives of head, living in largest 96 SMSA's--Continued

[Dependent variable: In or out of the labor force in March 1967]

| Interactions | | B coefficient | T value |
|---|---|---|---|
| Major activity and family head employment status: | | | |
| In school | Not in the labor force.... | -.1735 | - 2.0 |
| In school | Employed..... | -.1703 | - 2.1 |
| Employment change and unemployment rate: | | | |
| 4.1 to 5.0 | 5.50 to 6.49..... | -.0682 | - 1.9 |
| 5.1 and over | 5.50 to 6.49..... | -.0435 | - 1.3 |
| 4.1 to 5.0 | 6.50 and over..... | .0758 | 1.1 |
| 5.1 and over | 6.50 and over..... | -.0466 | - 0.9 |
| Sex and employment change: | | | |
| Female | 5.50 to 6.49..... | -.0312 | - 1.1 |
| Female | 6.50 and over..... | .0368 | .3 |
| Sex and unemployment rate: | | | |
| Female | 4.1 to 5.0..... | -.0111 | - 0.4 |
| Female | 5.1 and over..... | -.0588 | - 1.9 |
| Major activity and welfare recipient status: | | | |
| In school | Recipient..... | .0213 | .5 |

$R^2$ = .232 N = 5789

Mean of DV = .4755 SEE = .4386

Probability of making a correct prediction = .7154

Table G-13. Labor force participation regression of youth, (16-21) children or other relatives of family head living in largest 96 SMSA's
[Dependent variable: Hours supplied in 1966]

| Independent variables | B coefficient | T value |
|---|---|---|
| Constant | 393.08 | 7.3 |
| Age: | | |
| 16 to 17 | --- | --- |
| 18 to 19 | 373.65 | 16.7 |
| 20 to 21 | 668.16 | 25.6 |
| Race: | | |
| White | --- | --- |
| Negro | 29.65 | 0.8 |
| Sex: | | |
| Male | --- | --- |
| Female | 41.38 | 2.1 |
| Unemployment rate: (in percent) | | |
| 0 to 2.5 | --- | --- |
| 2.6 to 4.0 | 12.93 | 0.4 |
| 4.1 to 5.0 | 27.38 | 0.7 |
| 5.1 and over | - 75.35 | - 1.9 |
| Employment change (1965-66): (in percent) | | |
| Less than 3.50 | --- | --- |
| 3.50 to 5.49 | - 3.80 | - 0.1 |
| 5.50 to 6.99 | - 12.36 | - 0.4 |
| 7.00 and over | 22.00 | 0.5 |
| Relative opportunities: | | |
| Less than 72.0 | --- | --- |
| 72.0 to 89.9 | 20.67 | 0.5 |
| 90.0 and over | 3.59 | 0.1 |
| Residence: | | |
| Other than poverty tract | --- | --- |
| Poverty tract | 124.24 | 3.8 |
| Weeks worked of family head: | | |
| 50 to 52 | --- | --- |
| 48 to 49 | 70.06 | 1.2 |
| 40 to 47 | 28.06 | 0.6 |
| 27 to 39 | 66.47 | 1.1 |
| 0 to 27 | 182.51 | 5.7 |

$R^2$ = .162 N = 4089
Mean of DV = 782.49 SEE = 621.25

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